The experiences of CSSD and OR staff in relation to missing surgical instruments at a Public hospital, Eastern Region, Saudi Arabia

By

Annalene Simmons

Thesis presented in partial fulfillment of the requirements for the degree of Master of Nursing Science in the Faculty of Health Sciences at Stellenbosch University

Supervisor: Dr Mariana van der Heever

Date: March 2021

DECLARATION

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

Date: March 2021

ABSTRACT

Background: The Central Sterilize Supply Department (CSSD) needs to provide the Operating Room (OR) with specific instruments and precise quantities thereof for specific procedures in a timely manner. CSSD and OR staff must follow organizational and international counting policies and procedures to avoid missing surgical instruments and inaccurate surgical trays. Missing surgical instruments were viewed as a contributor to conflict between the two departments. To achieve the best quality outcomes, clear communication between OR and CSSD staff is important to resolve and avoid conflict over missing surgical instruments.

Aim: To explore the experiences of CSSD and OR staff in relation to missing surgical instruments and inaccurate surgical trays.

Objectives:

- To demonstrate an understanding of the current counting practices of surgical instruments of OR nurses and CSSD technicians.
- Describe the experiences of CSSD technicians and OR nurses in relation to quality assurance measures that serve to prevent the loss of surgical instruments and the presence of inaccurate surgical trays.
- To explore the experiences of OR nurses and CSSD technicians in relation to inaccurate surgical trays and missing instruments.

Method: A qualitative descriptive design was employed to gain understanding of why instruments went missing between the OR and CSSD and why surgical trays remained inaccurate at times. The population comprised of OR nurses and CSSD technicians who had worked at either OR or CSSD at two military hospitals in Saudi Arabia. The final sample comprised n=11 participants; 06 OR nurses and 05 CSSD technicians. All participants were purposefully selected for participation in the study. Thematic data analysis was performed according to Braun and Clarke's six-step strategy for qualitative data analysis. The Health Research Ethics Committee at Stellenbosch University provided ethical clearance. Thereafter, institutional permission to conduct the study was granted. Informed written consent to participate in the study was obtained from the study participants. Trustworthiness was strengthened using principles such as credibility, dependability, confirmability and transferability.

Results: Six themes came to the fore from the data analysis, i.e. adhering to surgical count policies and procedures, adhering to quality assurance measures, surgical instruments counting process, managerial support, miscommunication between OR and CSSD and educational support

Keywords: CSSD technicians, OR nurses, sterilization procedures, surgical instrument counting, missing and inaccurate instruments.

OPSOMMING

Agtergrond: Die Sentrale Departement vir Steriliseringsverskaffing (SDSV) moet die operasie-saal (OS) met spesifieke chirurgiese instrumente en die presiese hoeveelhede vir spesifieke prosedures vroegtydig verskaf. SDSV- en OS-personeel moet organisatoriese en internasionale kontroleringsbeleide en prosedures volg om die verplasing van chirurgiese instrumente en onakkurate chirurgiese blaaie te voorkom. Die verplasing van chirurgiese instrumente word as ‘n oorsaak van konflik tussen die twee departemente beskou. Om die gewenste gehalte-uitkomste te bereik, is duidelike kommunikasie tussen SDSV- en OS-personeel belangrik om konflik oor die verplasing van chirurgiese instrumente te vermy en op te los.

Doel: Om die ervaringe van SDSV- en OS-personeel met betrekking tot die verplasing van chirurgiese instrumente en onakkurate chirurgiese blaaie te ondersoek.

Doelwitte:

- Om die huidige kontroleringspraktyke van chirurgiese instrumente deur OS-verpleegsters en SDSV- tegnici te verstaan.
- Om die ervaringe van SDSV-tegnici en OS-verpleegsters, met betrekking tot gehalte versekeringsmaatreels wat dien om die verplasing van chirurgiese instrumente en die onakkurate chirurgiese blaaie, te beskryf
- Om die ervaringe van OS-verpleegsters en SDSV-tegnici met betrekking tot onakkurate chirurgiese blaaie en die verplasing van chirurgiese instrumente te ondersoek.

Metode: ‘n Kwalitatiewe beskrywingsontwerp was gebruik om te begryp waarom chirurgiese instrumente tussen OS- en SVSD-personeel verplaas word, en waarom chirurgiese blaaie met tye onakkuraat is. Die gemeenskap het uit OS- verpleegsters en SVSD-tegnici, werksaam by die OS of SVSD van twee militêre hospitale in Saudi Arabia, bestaan. Die finale steekproefgroote was n=11 bestaande uit 06 OS verpleegsters en 05 SDSV tegnici. Alle deelnemers was doelbewus vir deelname in die studie geselekteer. Tematiese data-analise is volgens Braun en Clarke se ses-stappe strategie vir kwalitatiewe data-analise uitgevoer. Etiese toestemming is van die Gesondheidsnavorsing se Etiekkomitee Stellenbosch Universiteit verkry. Vervolgens is institusionele toestemming verkry vir die navorsing. Deelnemers het skriftelik ingestem tot deelname aan die studie. Vir betroubaarheid is gebruik gemaak van beginsels soos kredietwaardigheid, afhanklikheid, bevestiging en toepasbaarheid .

Resultate: Ses temas het uit die data-analise gespruit, nl. die nakoming van chirurgiese kontroleringsbeleide en prosedures, die nakoming van gehalte versekeringsmaatreels, kontroleringsprosesse van die chirurgiese instrumente, ondersteuning deur bestuur, swak kommunikasie tussen OS en SVSD en ondersteuning deur opleiding.

Sleutelwoorde: SVSD-tegnici, OS-verpleegsters, steriliseringsprosedures, chirurgiese instrumentkontrolering, verplaaste instrumente en onakkurate chirurgiese blaaie

ACKNOWLEDGEMENTS

I am forever grateful to God, for good health and wellbeing bestowed upon me to complete this thesis.

I have a few people to express my gratitude to, for their indispensable encouragement and guidance in completing this research study.

My humble appreciation goes to my supervisor Mariana Van der Heever. Thank you for your patience, guidance, and availability always.

Thank you to my husband, David for always believing in me and for the continued support and encouragement throughout this study.

Thanks to my mother for the encouragement during these times and always believing in me.

For assisting me with the interviews, I thank Prisca Dlamini. Your contribution to this study is highly appreciated.

Thank you to the staff in the OR and the CSSD for their support, inputs, and encouragement.

Thank you to Valerie Doughty who has always been an inspiration.

Finally, I am profoundly grateful for the permission granted to me by the institution where this research took place.

TABLE OF CONTENTS

Declaration… ..... **ii**
Abstract……. ..... **iii**
Opsomming… ..... **v**
Acknowledgements ..... **vii**
List of tables.. ..... **xiii**
List of figures ..... **xiv**
List of appendices ..... **xv**
Abbreviations ..... **xvi**
Chapter 1: Foundation of the study **1**
1.1 Introduction 1
1.2 Significance of the problem 1
1.3 Rationale 2
1.4 Research problem 5
1.5 Research questions 5
1.6 Research aim 5
1.7 Research objectives 5
1.8 Research methodology 6
1.8.1 Research design 6
1.8.2 Study setting 6
1.8.3 Population and sampling 6
1.8.4 Interview guide 6
1.8.5 Pilot interview 6
1.8.6 Trustworthiness 6
1.8.7 Data collection 6
1.8.8 Data analysis 6
1.9 Ethical considerations 7
1.10 List of definitions 7
1.11 Duration of the study 8
1.12 Chapter outline 9
1.13 Significance of the study 9
1.14 Summary 9
Chapter 2: Literature review **10**

2.1 Introduction....10
2.2 Electing and reviewing the literature....10
2.3 Framework of the literature review....10
2.3.1 International policies and standards....11
2.3.1.1 Saudi Arabian public hospital policies and procedures for the control of missing surgical instruments....12
2.3.2 Management of surgical instruments in CSSD....12
2.3.2.1 Decontamination process....12
2.3.2.2 Inspection and preparation process....13
2.3.2.3 Sterilization process....13
2.3.3 Controlling surgical instruments in OR....14
2.3.3.1 Recommended practice....14
2.3.3.2 Types of counts for surgical instruments....14
2.3.3.3 Procedure for counting....15
2.3.4 Advanced technology for sterile processing....16
2.3.5 Poor teamwork....16
2.3.6 Staff engagement....16
2.3.6.1 Educate CSSD technicians....17
2.3.7 Align leadership....17
2.3.7.1 Personal links....18
2.3.8 Factors influencing the misplacement of surgical instruments and the accuracy of surgical trays....18
2.3 8.1 Inconsistency of practice....19
2.3.8.2 OR and CSSD dynamics....19
2.3.8.3 Heavy workload....20
2.3.9 Negative consequences of missing surgical instruments....20
2.3.10 Counting and documentation procedure in Saudi Arabian public hospitals....21
2.3.11 Best practice policies....22
2.3.12 Quality assurance measures: organizational policies for counting and documentation....22
2.3.12.1 Avoidance of variation in counting and documentation practice....22
2.3.12.2 Accountability of OR nurses and CSSD technicians....23
2.3.12.3 Training....23
2.3.12.4 Performance evaluation....23

2.3.12.5 Regular audits 23
2.4 Summary 24
Chapter 3: Research methodology 25
3.1 Introduction 25
3.2 Aim and objectives 25
3.3 The objectives of this research were: 25
3.4 Study setting 25
3.5 Research design 26
3.6 Population and sampling 26
3.6.1 Inclusion criteria 27
3.6.2 Exclusion criteria 27
3.7 Instrumentation 28
3.8 Pilot interview 28
3.9 Trustworthiness 28
3.9.1 Credibility 28
3.9.2 Transferability 29
3.9.3 Dependability 29
3.9.4 Confirmability 30
3.10 Data collection 30
3.10.1 The interviews 30
3.11 Ethical considerations 31
3.11.1 Informed consent and voluntary participation 32
3.11.1 Right to self-determination 32
3.11.2 Right to confidentiality and anonymity 32
3.11.3 Right to protection from discomfort and harm 32
3.12 Data analysis 32
3.12.1 Braun and Clarke's six phases of thematic analysis 33
3.12.1.1 Phase 1: Familiarising of the data 33
3.12.1.2 Phase 2: Generating initial codes 34
3.12.1.3 Phase 3: Searching for themes 35
3.12.1.4 Phase 4: Reviewing themes 36
3.12.1.5 Phase 5: Defining and naming themes 36
3.12.1.6 Phase 6: Producing a report 36
3.13. Summary 36

Chapter 4: Findings 38
4.1 Introduction 38
4.2 Section A: Biographical data 38
4.3 Section B: Themes emerging from the interviews 38
4.3.1 Theme 1: Adhering to surgical counting policies and procedures 39
4.3.1.1 *International standards for counting process* 40
4.3.1.2 Educate staff to enhance compliance to organizational policies and procedures 40
4.3.1.3 Education not effective 40
4.3.1.4 Strengthening new knowledge 41
4.3.2 Adhering to quality assurance measures 41
4.3.2.1 Regular updates of quality assurance measures 41
4.3.2.2 Oblivious to regular updates of quality assurance measures 42
4.3.2.3 Adherence influenced by workload 42
4.3.3 Surgical instruments counting process 43
4.3.3.1 Surgical instrument counting during sterilization process 43
4.3.3.2 Surgical instrument counting during surgical procedures 43
4.3.3.3 CSSD provides incomplete trays not labelled as such 44
4.3.3.4 Conflict over poor counting practice 45
4.3.4 Managerial support 45
4.3.4.1 Management to listen to the staff 45
4.3.4.2 Culture of blame 46
4.3.5 Miscommunication between OR and CSSD 46
4.3.5.1 Miscommunication between OR and CSSD augments the misplacement of instruments 47
4.3.5.2 Language barriers contribute to miscommunication 47
4.3.5.3 Unilateral meetings of CSSD technicians and OR contribute to miscommunication. 48
4.3.6 Educational support 48
4.4 Summary 49
Chapter 5: Discussion, conclusions, and recommendations 50
5.1 Introduction 50
5.2 Discussion of findings 50
5.2.1 Objective 1: To demonstrate an understanding of the current counting practices of surgical instruments of OR nurses and CSSD technicians. 50

5.2.2 Objective 2. Describe the experiences of CSSD technicians and OR nurses in relation to quality assurance measures that serve to prevent the loss of surgical instruments and the presence of inaccurate surgical trays. 51
5.2.3 Objective 3. To explore the experiences of OR nurses and CSSD technicians in relation to inaccurate surgical trays and missing instruments. 52
5.3 Limitations of the study 52
5.4 Recommendations 53
5.4.1 Education and training 53
5.4.2 Quality assurance 54
5.4.3 Supportive work environment 54
5.5 Recommendations for further research 55
5.6 Dissemination 55
5.7 Summary 55
5.8 Conclusions 55
References 57
Appendices 61

LIST OF TABLES

Table 1.1: Duration of the study.....8
Table 4.1: Themes and subthemes that emerged.....38

LIST OF FIGURES

Figure 3.1: Phases of thematic analysis (Adapted from Braun and Clarke, 2012).....33
Figure 3.2: Overview of the code-generating process.....34
Figure 3.3: Overview of the theme-generating process.....35

LIST OF APPENDICES

Appendix 1: Ethical approval from Stellenbosch University 61
Appendix 2: Permission obtained from private institution 63
Appendix 3: Permission obtained from research operations 64
Appendix 4: Participant information leaflet and declaration of consent by participant and investigator 65
Appendix 5: Interview guide 68
Appendix 6: Confidentiality agreement with data transcriber 69
Appendix 7: Extract of transcribed interview 70
Appendix 8: Investigator declaration 71
Appendix 9: Turnitin report 72
Appendix 10: Declaration by language editor 73
Appendix 11: Declaration by technical editor 74

ABBREVIATIONS

CSSD- Central Sterilize Supply Department

OR- Operating Room

LPI- Lean Process Improvement

TPS- Toyota Production System

ANS -American National Standards Institute

AAMI- Association of Advancement of Medical Instrumentation

AORN- Association of Peri-operative Registered Nurses

QA- Quality assurance

CHAPTER 1: FOUNDATION OF THE STUDY

1.1 Introduction

The Central Sterilize Supply Department (CSSD) needs to provide the Operating Room (OR) with specific instruments and the precise quantity for a specific procedure in a timely manner. Missing instruments influence the completeness and accuracy of surgical trays and may lead to confusion, stress and loss of time, as staff members in CSSD and OR have to assist with finding the instruments, in order to complete the trays (Banu & Subhas, 2013: 58-62). It is therefore important to always know the exact location of instruments, due to the difficulty of tracing instruments that are missing.

Successful surgical procedures are dependent on the availability of sterile instruments. The CSSD in a hospital has a chain of responsibilities referred to as the reprocessing of instruments, i.e. ensuring the on-going availability of sterile instruments. The needs of the OR determine this complexity of the process. Globally, public sector hospitals are working diligently to improve their CSSDs to ensure best practice and quality patient outcomes (Huber, 2010:319-320).

The CSSD is sometimes seen as an "out of sight, out of mind" process for the public hospitals of Saudi Arabia within the Eastern Region when things are going well. This department can very rapidly become the centre of attention when problems arise. For example, the situation may escalate quickly into critical scenarios if the CSSD provides a contaminated instrument that can lead to infection or other adverse outcomes, or if the department is unable to provide an urgently needed sterile instrument in the midst of a life-threatening emergency (Joint Commission International Standards, 2017:6).

1.2 Significance of the problem

The Lean Process Improvement (LPI) strategy was adopted at the hospitals under study in 2019/2020 as a quality assurance measure to assist with the sustainment and management of CSSD functions and the on-going availability of instruments (Huber, 2010:319-320). LPI is a production method developed in Japan by Toyota Production System (TPS). Toyota car manufacturing developed the concept to help them with their production operation and to improve processes to cut the time it takes from receiving an order to distributing it.

In the context of the OR the purpose of the LPI was to identify what is of value to the patients, and deliver it consistently, while minimizing the amount of material utilized and the amount of non-value-added effort expended (Joint Commission International Standards, 2017:6). According to the Joint Commission International Standards (2017:5) in the case of CSSD, the mission is to deliver the precise sterile surgical instruments to the OR in the right condition and at the right time. LPI is a competitive strategy, based on forcing functions, that is specifically designed to improve operational performance, eventually leading to a high level of performance called operational excellence (Joint Commission International Standards, 2017:6). Furthermore, forcing functions are globally implemented in most CSSD and OR to support staff to follow the correct process and procedures for their patients while reducing the cognitive loads. Cognitive loads are mostly defined as the amount of mental resources needed for information processing (Shriyan, 2015:7-16). These forcing functions are control measures designed to prevent errors in CSSD and in OR. These control measures relate to the implementation of a doctor's preference carts for surgical procedures to reduce the occurrence of missing surgical instruments during surgical procedures. The barcode system is also a control measure that serves as a manual inventory tracking method, especially when instruments are found in the wrong surgical trays. The staff in the CSSD and OR can then easily scan the item and send it back to the original place where it belongs.

Statistics for missing instruments at the institutions under study show that a total of one hundred-and-fifty instruments went missing in 2016. The numbers decreased to respectively one hundred in 2017, one hundred-and-five in 2018 and seventy in 2019 and 2020. One therefore deduced that the decrease was related to the implementation of the LPI measures.

However, the researcher, who is the nurse manager of OR, observed that despite the implementation of the LPI Improvement strategy, instruments continued to go missing. It was therefore considered important to explore the experiences of CSSD and OR staff in relation to missing surgical instruments.

1.3 Rationale

The Joint Commission International Standards (2017:6) stated that a quality improvement programme in the Unites States was adopted that focussed on service excellence. This service excellence programme displayed that the CSSD and OR staff focussed on quality outcomes. As CSSD and OR staff perform their daily tasks, they must have the knowledge to support effective problem-solving and decision-making, and the understanding that every step in the CSSD and

OR has a direct impact on infection control and above all, on patient care and safety. To achieve the best quality outcomes, clear communication between OR and CSSD staff is important to resolve and to avoid the conflict over missing surgical instruments. Drummond and Skidmore (2011:937-943) relate that teamwork should be promoted to reduce stress and find solutions to have the instruments ready for surgical procedures.

As recommended by the Association for Advancement of Medical Instrumentation (AAMI) and the American National Standards Institute (ANSI) all CSSDs must follow the international standards to track surgical instruments back to each patient with which it was used. Furthermore, AAMI and ANSI also recommend for CSSDs to have an instrument tracking specialist that can ensure that inventories of surgical instruments are maintained and well documented (Sukhlecha, *et al.,* 2015: 1-6).

AAMI is a broad association that regulates standards to be followed by CSSD, healthcare technology technicians, as well as OR nurses and CSSD technicians (Hung & Lin, 2015:104). According to AAMI, each surgical instrument set has a count sheet that promotes accountability and prevents delays in surgery because of missing instruments. Furthermore, the Association of PeriOperative Registered Nurses (AORN) guidelines state that healthcare organizations should weigh the risks versus the benefits of having a count sheet ready for each surgery and to emphasize to OR nurses the accountability of having the count sheet to prevent missing instruments in the perioperative area (Shriyan, 2015:7-16).

Various surgical instrument sets are available for different surgeries. These various sets may contain hundreds of different individual instruments. Not every surgery will require every instrument in a particular set, but the goal of having large sets is to ensure that a surgeon will have everything that he or she may need to successfully complete an operation. Instruments are typically divided into three major categories: handheld, endoscopes, and power tools (Drummond & Skidmore, 2011:937-943).

During the cleaning and decontamination processes of the instruments, CSSD technicians must thoroughly count and check each instrument. In the event of missing instruments, the CSSD technicians should immediately inform his/her team leader about the instruments that are either absent/missing or broken (Hung & Lin, 2015:104).

Once the decontamination process is completed the inspection process begins. Thereafter, the CSSD technicians will hand over the clean instruments to the CSSD technicians in the

inspection and preparation room (Garbaccio & De Oliveira, 2013:77-82). The decontamination processes are not allowed to continue until the missing instruments have been found or the OR nurse has filed an incident report record, which will stipulate the name of the CSSD technician that sterilized the instruments and the name of the surgical instruments. These incident reports should state whether instruments were properly counted and or checked by CSSD technicians and if proper documentation was available at that time that might indicate that instruments were missing prior to surgeries. Therefore, for the CSSD technicians to process the instruments, they must account for and examine each single instrument to be able to proceed with the sterilization process. Once they find instrument trays that are incomplete, the process will be delayed until the instruments are found and properly documented (Joint Commission International Standards, 2017:20).

The instrument sets should be totally complete for the CSSD technician assigned in the sterilization process room to sterilize the instruments. Before the technician will transfer the instruments into the sterilizer, he/she should ensure instrument sterilization documentation is accurate and complete. This documentation includes the correct name of the instruments and the correct location where it belongs (Drummond & Skidmore, 2011:937-943).

CSSD technicians should communicate effectively with the OR nurses, regarding the content of instruments in surgical sets; whether these are indeed suitable for the surgical procedure to be carried out (Favero & Bond, 2015:881-917). The job of a CSSD technician is complex. The CSSD technicians must process large numbers of instruments and manage with limited resources. In the current practice, CSSD technicians must be knowledgeable about the different types of instruments and how it can best be used in surgeries. With advanced technology, it is crucial for CSSD technicians and OR nurses to stay up to date on current technologies in order to ensure quality outcomes during the CSSD and OR workflow that can help to decrease the number of missing instruments. Advanced technology devices are available, such as the barcoded scanner device and electronic tracking systems, that can link to each patient who underwent surgical procedures that can indicate if a surgical set is incomplete before it will be decontaminated, inspected for sterilization and to have an accurate surgical instrument ready for the surgical procedures (Shriyan, 2015:7-16).

In the researcher’s experience as a CSSD / OR nurse manager and acting director for OR, it is observed that despite the fact that the technicians and OR staff adhere to the policy, instruments still go missing and therefore, at times surgical trays are incomplete/inaccurate prior

or post-surgery. Implementing standards and reinforcing practices have proven to decrease the inaccurate counting of surgical instruments.

1.4 Research problem

The researcher through observation has identified that improvement was rather slow after the implementation of quality improvement projects in CSSD and OR to control the phenomenon of missing surgical instruments in two public hospitals in the Eastern Region of Saudi Arabia. Statistics for missing instruments decreased gradually from one hundred-and-fifty in 2016 to seventy in 2019. Literature is clear about the sterilization processes of surgical instruments that should be followed by CSSD technicians. However, limited literature was found in relation to missing instruments and inaccurate surgical trays. Previous research (Gue´don, et al., 2016; Zhu, Yuan, Li & Cheng, 2019) mostly employed quantitative designs to explore the phenomenon at hand. The current study employs a qualitative design to gain understanding from those involved in the processing and management of these instruments and trays. Subsequently, the proposed study was focussed on understanding CSSD technicians and OR nurses' experiences about inaccurate surgical trays and missing instruments in the Eastern Region of a Saudi Arabian public hospital.

1.5 Research questions

What are the experiences of CSSD and OR staff in relation to missing surgical instruments and inaccurate surgical trays?

1.6 Research aim

The goal of this study was to explore the experiences of CSSD and OR staff in relation to missing surgical instruments and inaccurate surgical trays.

1.7 Research objectives

- To demonstrate an understanding of the current counting practices of surgical instruments of OR nurses and CSSD technicians.
- Describe the experiences of CSSD technicians and OR nurses in relation to quality assurance measures that serve to prevent the loss of surgical instruments and the presence of inaccurate surgical trays.
- To explore the experiences of OR nurses and CSSD technicians in relation to inaccurate surgical trays and missing instruments.

1.8 Research methodology

In chapter 1 a brief overview of the methodology of the research is presented. The methodology is described in detail in chapter 3.

1.8.1 Research design

A qualitative descriptive design was employed to gain an understanding of why instruments went missing between the OR and CSSD and why surgical trays remained inaccurate at times.

1.8.2 Study setting

The proposed setting was at two public hospitals in the Eastern Region of Saudi Arabia.

1.8.3 Population and sampling

This comprised of OR nurses and CSSD technicians who had worked for more than one year at either OR or the CSSD at 2 military hospitals in Saudi Arabia. Six participants were purposefully selected at each participating institution

1.8.4 Interview guide

During individual interviews a semi-structured interview guide (Appendix B), based on the objectives of the study to collect data was used (Grove, Burns & Gray, 2013:271).

1.8.5 Pilot interview

This was done at the public hospital with one participant who met the study inclusion criteria and the information collected, formed part of the research.

1.8.6 Trustworthiness

Four principles to ensure trustworthiness as described by Lincoln and Guba (1985) were applied: credibility, dependability, transferability and confirmability. These principles are discussed further in chapter three.

1.8.7 Data collection

Individual interviews were conducted using the semi-structured interview guide to collect data.

1.8.8 Data analysis

Thematic data analysis was applied according to Braun and Clarke's 6-step strategy for qualitative data analysis (2012:2).

1.9 Ethical considerations

The Health Research Ethics Committee at Stellenbosch University (Ethics reference number - S20/04/101) gave ethical clearance. Thereafter, institutional permission was granted to conduct the study. Informed written permission to participate in the study was obtained from the study participants. Other applicable ethical principles that were maintained are the right to self-determination, privacy, confidentiality and anonymity.

1.10 List of definitions

Cleaning: refers to removing visible debris, dirt, and microorganisms by using soap or detergent and water (Drummond & Skidmore, 2011: 937-943).

Decontamination: refers to the process to remove bacteria from instruments through mechanical automatic washer disinfectors or manual cleaning as indicated by the manufacturer (Drummond & Skidmore, 2011: 937-943).

Experience: is the ability to have the knowledge, skills, attitude, judgement, energy, and enthusiasm to appropriately fulfil the requirements of one's professional responsibilities (Armstrong *et a*l., 2017:134).

Sterilization: refers to the process to remove and kill bacteria and spores from surgical instruments through temperatures between 121°C (250°F) and 134°C (273°F), under 15 psi (0.5 bar) pressure and steam. The device used to sterilize instruments is called a sterilizer (Garbaccio & De Oliveira, 2013:77-82).

Surgical procedures: refers to a medical procedure that involves an incision with instruments to repair or dissect the body organ in a living human being that gave consent for the specific procedure to be done (Shriyan, 2015:7-16).

Surgical instruments: are tools or devices needed for cutting, dissecting, grasping, holding, retracting, or suturing. Most surgical instruments are stainless steel. Surgical instruments from metals such as titanium, chromium, vanadium, and molybdenum, are also used (Drummond & Skidmore, 2011:937-943).

Lean process improvement (LPI): is an approach to run an organization that supports the concept of continuous improvement, a long-term approach to work that systematically seeks to achieve small, incremental changes in processes in order to improve efficiency and quality (Seavey, 2015: 482–485.).

Surgical count: the process of counting the exact number of surgical instruments before, during, and after an operation in order to reduce the likelihood of leaving an object inside a body cavity (Shriyan, 2015:7-16).

Perioperative: the course of the time of the surgical procedure in the OR (Drummond & Skidmore, 2011:938).

Central sterile supply department technician: performs and participates in decontamination, cleaning, assembling, packaging, scanning, sterilization, storage, and distribution of reusable surgical instrumentation and equipment (Huber, 2010:319-320).

Operating room nurse: caring for patients before, during and after surgery. Circulating OR nurses work within the operating suite but outside of the sterile field; scrub OR nurses prepare operating instruments and equipment within the sterile field (Drummond & Skidmore, 2011:937).

1.11 Duration of the study

Table 1.1: Duration of the study

Year	Month	Activity
2020	June	Ethics approval obtained
2020	June	Institutional permission granted
2020	June	Executing pilot interview
2020	July	Collecting data
2020	August - September	Analysing data
2020	August-November	Compiling dissertation
2020	November	Technical and grammar editing

• 2020	• December	• Submission of the thesis

1.12 Chapter outline

- **Chapter 1**: Foundation of the study
- **Chapter 2:** Literature review
- **Chapter 3**: Research methodology
- **Chapter 4**: The findings
- **Chapter 5:** Discussion and recommendations

1.13 Significance of the study

Surgical procedures in the operating rooms have increased. Most of these surgical procedures require an enormous amount of complex surgical instruments. Surgical procedures cannot continue if there are not enough surgical instruments in the hospitals. Therefore, CSSD technicians are valued as a surgical team and play a significant role in perioperative patient care. The CSSD technicians and the OR nurses should have adequate knowledge about the account of surgical instruments. The findings provided evidence as to how to manage the persistence of missing instruments and subsequent inaccurate surgical trays.

1.14 Summary

An overview of the study undertaken, the rationale, the problem statement, the objectives and the research methodology applied, are presented. A brief description of the ethical considerations and significance of the study was provided.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

A literature review about the experiences of CSSD and OR staff in relation to missing surgical instruments and inaccurate surgical trays is presented in this chapter.

Relevant information for a broader view, while exploring the information to establish what is known about missing surgical instruments and an inaccurate tray has been the purpose of the literature review (Grove, Gray & Burns, 2015:163).

2.2 Electing and reviewing the literature

Search engines such as CINAHL and MEDLINE were utilized over a period of 30 months and on-going support in this regard was provided by the librarian and the supervisor. Information from textbooks, journals, theses and relevant reports were included (Brink, Van der Walt & Van Rensburg, 2015:54). Information from grey literature such as newspapers, memos, presentation materials was also included. Resources selected for the study were published between 2011 and 2020. Nationally, limited published research was found on the chosen topic. Keywords used are: CSSD technicians, OR nurses, surgical procedures, sterilization procedures, surgical instrument counting, missing and inaccurate instruments.

2.3 Framework of the literature review

The review is presented in the following order:

- International policies and standards
- Surgical sets
- Management of surgical instruments in CSSD
- Surgical instrument controlling in OR
- Advanced technology for sterile processing
- Better communication and teamwork improve patient safety
- Factors influencing the misplacement of surgical instruments and the accuracy of surgical trays
- Institutional policy for quality assurance counting and documentation

2.3.1 International policies and standards

International associations such as the Association for Advancement of Medical Instrumentation (AAMI) and the American National Standards Institute (ANSI) regulate standards pertaining to the management of surgical instruments and trays to be followed by OR nurses and CSSD technicians (Hung & Lin, 2015:104). According to AAMI and ANSI, each surgical instrument set has a count sheet that promotes accountability and prevents delays in surgical procedures. Furthermore, guidelines for the Association of periOperative Registered Nurses (AORN) in the United States of America state that healthcare organizations should weigh the risks versus the benefits of having a surgical instrument count sheet ready for each surgery. Organizations should emphasize to OR nurses the accountability of having the count sheet that could prevent missing instruments in the perioperative area if counting and documentation of surgical instruments are completed according to these international policies and standards (Evangelista, *et al.,* 2020:14-28).

The AAMI and ANSI recommend that all CSSDs must follow the international standards to track surgical instruments back to each patient for whom it was used. Furthermore, AAMI and ANSI also recommend for CSSDs to have an instrument tracing specialist in the OR and in CSSD who can assist that inventories of surgical instruments are maintained and well documented (Evangelista *et al*., 2020:14-28).

The Joint Commission International (JCI) and AAMI recommend that a dedicated documentation system should be used in the OR and CSSD to trace detailed information for each patient who underwent a surgical procedure (Hung & Lin, 2015:104). Details to be included relate to e.g. the patient's name and hospital identification number, surgical procedure, the names of the surgeon, OR nurse who assisted the surgeon and the CSSD technicians who cleaned and sterilized the instruments.

The Joint Commission International Standards (2017:6) stated that a quality improvement programme for each healthcare organization needs to be developed that would focus on service excellence. The quality improvement programmes will assist to achieve the best quality outcomes, and clear communication between OR and CSSD staff that is important to resolve and to avoid the conflict over missing surgical instruments and inaccurate surgical trays. Drummond and Skidmore (2011:937-943) relate that quality improvement projects are important to promote teamwork, reduce stress, and to find solutions to avoid missing and inaccurate surgical instruments.

2.3.1.1 Saudi Arabian public hospital policies and procedures for the control of missing surgical instruments

Accounting and documentation errors are more frequent when no accounting and documentation policies are in place (Norton, et al., 2012:112). Deviation in accounting and documentation practice increases the risk of missing surgical instruments and inaccurate surgical trays. The thorough technique of conducting surgical instrument counting should be standardized to ensure accuracy. The standard, in relation to counting of surgical instruments, is to avoid erroneous counting of or missing surgical instruments before or after a procedure or the cleaning and sterilization processes (Phillips, 2013:23).

In Saudi Arabia, OR nurse and CSSD technicians are both responsible and accountable for counting of instruments and documentation to ensure patient safety, and that the correct surgical instrument is available for each specific procedure (Phillips, 2013:23). According to the Joint Commission International Standards (2017:20) it is the responsibility of the OR nurse and CSSD technician to document the correct number on the surgical count sheet. The count sheet is a legal document and can be used when a surgical instrument is missing. The requirements to practice in an OR include Saudi Commission for Health Specialties (SCHS) registration and possession of the postgraduate specialty qualification (The Joint Commission International Standards, 2017:20).

Disciplinary action for non-adherence to counting policies and procedures can include termination of a contract or salary deduction. Public hospitals in Saudi Arabia monitor how often certain staff members will make the common errors which indicate negligence (Phillips, 2013:23). Reckless behaviour can also lead to license withdrawal as determined by the SCHS (The Joint Commission International Standards, 2017:20).

2.3.2 Management of surgical instruments in CSSD

2.3.2.1 Decontamination process

During the cleaning of the instruments CSSD technicians must thoroughly count, check and document each instrument. In the event of missing instruments, the CSSD technicians should immediately inform his/ her team leader about the situation (Hung & Lin, 2015:104). The decontamination processes are not allowed to continue until the missing instruments have been found or the OR nurse has filed an incident report, which will stipulate the name of the CSSD technician who sterilized the instruments and the name of the surgical instruments (Shriyan,

2015:7-16). These incident reports will state that instruments were not properly counted nor checked by CSSD technicians and that documentation was incomplete. Therefore, for the CSSD technicians to process the contaminated instrument, they must account for and examine each instrument to be able to proceed with the sterilization process according to the hospital approved surgical instrument checklist (Seavey, 2015: 482–485). The surgical instrument checklist reflects the number of surgical instruments for each surgical tray to be used for a surgery procedure. Once they find instrument trays that are incomplete, the process will be delayed until the instruments are found and accurately documented (the Joint Commission International Standards, 2017:20). De Vries and Rosenberg (2016: 605–613) indicated that OR nurses and CSSD technicians are both responsible and accountable for the decontamination process of surgical instruments, thus ensuring that surgical instruments are complete and functional for the sterilization process.

2.3.2.2 Inspection and preparation process

Once the decontamination process is completed the inspection process begins whereby the CSSD technicians need to hand the clean instruments to the CSSD technicians that are assigned for the inspection and preparation (Garbaccio & De Oliveira, 2013:77-82). During the inspection process, skilled and trained CSSD technicians should count and inspect each instrument carefully to avoid the misplacement of any instrument(s) on an instrument set where it does not belong. Each instrument set has a specific count sheet that outlines the correct quantity and description of the instruments. Negligence can easily happen during the process. Therefore, the AAMI recommends that a duo or team of technicians should independently check each instrument tray to ensure instruments are packed exactly/ accurately according to the set or procedure (Garbaccio & De Oliveira, 2013:77-82). Chawla, Gupta and Onchiri (2016:169–178) explained that the significance of the functionality of each surgical instrument has an important effect on each surgical procedure to provide the best outcome for each patient's safety.

2.3.2.3 Sterilization process

The instrument sets should be totally complete for the CSSD technician assigned in the sterilization process room to sterilize the instruments (Seavey, 2015: 482–485). Before the technician will transfer the instruments into the sterilizer, he/she should ensure instrument sterilization documentation is accurate and complete. This documentation includes the correct name of the instruments and the correct location where it belongs (Drummond & Skidmore,

2011:937-943). Once the sterilization processes are completed, the CSSD technician will return the sealed instruments that will be used for surgical procedures to the OR (The Joint Commission International Standards, 2017:6). According to O'Hara, Patel and Caldwell (2015:1197–1200) after the sterilization process, instruments must be completely accurate for each surgical procedure. The instrument checklist must be displayed on the outside of each sterile tray/set to indicate that the instruments were counted by a pair of CSSD technicians (Chawla, Gupta & Onchiri, 2016:169–178).

2.3.3 Controlling surgical instruments in OR

2.3.3.1 Recommended practice

The counting of surgical instruments in the OR must be completed according to AAMI, AORN, JCI, and ANSI to uphold best practice and to avoid surgical instruments from being missing during a surgical procedure (Blackmore, *et al.,* 2013:99-105). It is recommended by the Joint Commission International Standards (2017:6) that the counting of instruments should be performed of all procedures that present with the possibility that an instrument could go missing. Furthermore, the Joint Commission International Standards (2017:6) asserted that OR nurses must develop and implement healthcare processes according to the policies for the performance of the counting of surgical instruments.

As described by Edel (2012:229) organizational policies may indicate procedures or types of surgical procedures, when counting of surgical instruments is not required. However, the recommendation is that the counting of instruments should include unexpected cases as part of the broader scope of the procedure which can cause surgical instruments to go missing (Favero & Bond, 2015:881-917). Edel (2012:229) had found that if the correct surgical instrument counting practices are applied in OR and CSSD, patient safety improved during the surgical procedures and surgical procedures are completed with no delays. Weinshel, Dramowski and Hajdu (2015:1208–1214) stated that the managing surgical instruments correctly is important to reduce the risk of missing surgical instruments, as well as inaccurate surgical trays.

2.3.3.2 Types of counts for surgical instruments

The initial count happens with the commencement of the surgical procedure where the OR nurse counts each surgical instrument. The number should then be recorded on the count sheet as reference to ensure that the set/tray was complete (The Joint Commission International

Standards, 2017:6). Counting should occur as follows: prior to the skin incision and prior to closure of the body cavity (Edel, 2012:229).

Occurrences when additional counting should occur include intraoperative addition of an instrument and during shift changes of the OR nurses. During the course of a surgical procedure / intraoperative additions, instruments should be recorded on the count sheet and added to the initial count (Shriyan, 2015:7-16). Chawla, Gupta and Onchiri (2016:169–178) stated that when a surgical counting is taking place there should be no interruptions. In the event of an interruption, the counting must resume at the last recorded item on the surgical count checklist. Surgical instruments must be counted in an organized manner using the surgical instrument checklist to ensure that all instruments are documented. After each counting procedure, the OR nurses and the CSSD technicians must utilize the checklist to document the accuracy and completeness of the instruments and trays (O'Hara, Patel & Caldwell, 2015:1197–1200).

2.3.3.3 Procedure for counting

The procedure for counting instruments should include the following guidelines: A pair of OR nurses should audibly count each surgical instrument. Both nurses should be able to see each instrument to decrease the risk for incorrect counting. Organization policies and procedures should dictate the method of counting, e.g. each instrument counted individually or as a tray (Shriyan, 2015:7-16; Edel, 2012:229).

All parts of instruments that can be disassembled should be counted and recorded on the count sheet. Surgical instrument counting should be performed in the same sequence each time; organization policies and procedures should define the sequence. A standardized method for conducting the instrument counting aids the OR nurses in knowing that the counting will always be performed in the same way for every procedure, in order to contribute to accuracy and efficiency (Zheng, Hu & Xin 2016: 2469–2477).

The OR nurses should never assume the instrument counting performed in the CSSD is correct. Not performing instrument counting and assuming the count sheet that has been completed by the CSSD technicians is correct, should not be an accepted practice (Edel, 2012:229). It should be the responsibility of the OR nurses to account for all instruments during the surgical procedure. All counted instruments, including broken or separated instruments, should not be

removed from the OR, until the completion of the procedure, and all counting have been verified as being correct and well documented on the count sheet (Evangelista *et al.,* 2020:14-28).

2.3.4 Advanced technology for sterile processing

CSSD technicians should communicate effectively with the OR nurses, regarding the content of instruments in surgical sets; whether these are indeed suitable for the surgical procedure to be carried out (Favero & Bond, 2015:881-917). The CSSD technicians process many instruments and manage these with limited resources. In the current practice, with advanced technology, CSSD technicians must know the different types of instruments and how it can best be used in surgeries. CSSD technicians and OR nurses must be aware of current technologies to ensure quality outcomes during the CSSD and OR workflow that can help to decrease the number of missing instruments (Biccard, 2018:1589). Advanced technology devices are available, such as the barcoded scanner device and electronic tracking systems link to each patient who underwent surgical procedures. These devices can indicate if a surgical set is incomplete before it will be decontaminated, inspected for sterilization and to have an accurate surgical instrument ready for the surgical procedures (Shriyan, 2015:7-16).

2.3.5 Poor teamwork

According to Biccard (2018:1589) the relationships between the OR nurses and the CSSD technicians are not always smooth and lack of teamwork can result in instruments going missing. Globally, most CSSD technicians handle a huge volume of surgical instruments daily. CSSD staffs receive little support from OR nurses when it comes to management of surgical instruments. Recent research found that relationship issues among staff members can influence teamwork (Biccard, 2018:1589). According to Daudt, Van Mossel and Scott (2013:13-48) the route to better teamwork begins with improved communication and engaging in constructive dialogue and active listening.

De Vries and Rosenberg (2016: 605–613) stated that poor team work in OR and CSSD can have an impact on how the staff count the surgical instruments.

2.3.6 Staff engagement

Zheng, Hu and Xin (2016: 2469–2477) have defined staff engagement as the link between OR nurses and CSSD technicians. This means changing the way staff perform the counting and documentation of surgical instruments, by utilizing effective communication with one another. Staff who feel committed towards their organization will take actions to ensure the organization’s

success. Furthermore, their commitment to be accountable will ultimately benefit their work (Forrester, Koritsanszky & Parsons, 2018:25–32).

2.3.6.1 Educate CSSD technicians

Forrester, Koritsanszky and Parsons (2018:25–32) relate the absence of dedicated educators and on-going education and training of CSSD staff. Newly hired personnel generally learn how to carry out their tasks from existing staff. CSSD technicians normally learn the department processes, but do not gain an understanding of the purpose of various instrument sets or how instruments are used in the OR.

Zheng, Hu and Xin (2016: 2469–2477) recommend two strategies for building the CSSD technician's knowledge. These include: 1. the exposure of CSSD technicians to surgical procedures, and 2. providing CSSD technicians the opportunity to observe how instruments are correctly used, counted, and documented. These strategies can help CSSD technicians to understand the importance of instrument accuracy. It can also highlight the importance of instrument inspection, counting and documentation in the CSSD (Drummond & Skidmore, 2011:937-943). Forrester, Koritsanszky and Parsons (2018:25–32) conceded to assign experts in providing in-service instruction to CSSD technicians and OR nurses. Education sessions can provide the CSSD technicians and OR nurses with more in-depth explanations of correct counting and documentation to avoid the missing of instruments.

2.3.7 Align leadership

Merchant, Hendel and Shockley (2015:2630–2635) explained that most CSSDs are isolated from the rest of the hospital, both physically and organizationally. The separation is at the root of many communication problems. However, CSSD isolation can be improved through strong departmental leadership (The Joint Commission International Standards, 2017:20). One solution is to make sure the CSSD and OR managers work together as a team. The Joint Commission International Standards (2017:20) stated that when CSSD and OR managers are aligned, the CSSD and OR workflow can be strengthened through teamwork. The teamwork between the leaders can also ensure that CSSD and OR staff get the resources and support they need to provide best quality outcomes. Strong leadership is critical to improve patient safety and to decrease the number of missing surgical instruments, and to uphold best counting practice (Forrester, Koritsanszky & Parsons, 2018:25–32).

2.3.7.1 Personal links

Collaboration between OR and CSSD staff can solve missing surgical instruments and improve communication. Teamwork builds strong relationships among staff and at the same time staff can get to know one another and walk a bit in each other's shoes when facing daily challenges as stated by Edel (2012:228). Building stronger personal links between staff members will improve the entire OR and CSSD workflow as a synchronized team (Blackmore *et al.,* 2013:99-105). Managers in OR and CSSD should ensure that staff have collaborative staff meetings in order to share the reason for staff not counting surgical instruments (Forrester, Koritsanszky & Parsons, 2018:25–32).

2.3.8 Factors influencing the misplacement of surgical instruments and the accuracy of surgical trays

According to Edel (2012:228), counting and documentation of surgical instruments require annual validation for consistency of CSSD technicians and OR nurses. Accountability of surgical instruments is required for surgery; there should not be any missing instruments from the instrument tray. The performance of human counting manually can increase the chance of human error, as well as subsequent recounts because of contributing factors (Norton, Martin & Micheli, 2012:112). According to Nicolay *et al.* (2012: 324–35) there are usually many contributing factors, but human beings are imperfect and mistakes are most likely due to human error, which can lead to inaccuracy and the missing of surgical instruments.

Blackmore *et al.* (2013:99-105) conceded that each OR and CSSD has its own set of interruptions. It is vital that the CSSD and OR staff for the safety of the patient when counting be particularly aware of the most common distractors caused by changes in the surgical procedure. Delays in the surgical procedure can occur when OR nurses suddenly need additional surgical instruments and if CSSD technicians do not have the surgical instruments ready. Shortage of staff in OR and in CSSD can have an influence on the accuracy of counting surgical instruments. This occurs when staff is not following the organization's counting and documentation policies and practices (Cao's, 2015:26). Lack of communication and teamwork between OR and CSSD team members increase the risk of inaccurate trays and missing surgical instruments. It was therefore deduced that OR and CSSD could benefit from clinical experts to educate staff regarding surgical instrument counting policies and practices (Edel, 2012:228-229).

2.3 8.1 Inconsistency of practice

Differences in practices with the handling of surgical instruments were identified as an important factor that influences surgical instruments gone missing (Cao's, 2015:26). It is suggested by a number of studies that differences in counting and documentation practices, increase the risk of missing surgical instruments (Edel, 2012:228; Forrester, Koritsanszky & Parsons, 2018:25–32; Biccard, 2018: 1589).

Edel (2012:231) established that OR and CSSD staff should have a broad understanding of organizational counting and documentation policies and procedure to assist with the consistency of surgical counting practices. Cao's (2015:26) study showed that deviation from the normal procedure leads to error. Surgical instrument counting and documentation differ from person to person. For Edel (2012:228) some variation is acceptable but broad ranges of policy interpretation can result in different practices.

Different practices occur because of limited technological solutions that could help healthcare professionals in locating surgical instruments. Standardized barcodes, as well as transmitters for surgical trays and individual instruments are already used in hospitals, but these are only effective if the staff are properly trained to use such technology (Edel, 2012:230). Blackmore *et al*. (2013:99-105) supported the observation of accountability and documentation practices varying between institutions and inconsistencies that exist in the interpretation of applying guidelines. Furthermore, OR nurses and CSSD technicians rely on one another for an accurate account of the number of instruments and disposables. Observation and evaluation by supervisors are vital to ensure that the practice consistently corresponds with the organizational policies and procedures (Cao's, 2015:26).

2.3.8.2 OR and CSSD dynamics

Rowlands and Steeves (2010:410) identified unacceptable behaviour and miscommunication of OR and CSSD staff that affect the outcome of surgical instrument counting and documentation as challenging. According to Rowlands and Steeves (2010:410) examples of unaccepted behavior are bullying and aggressive behaviour between OR and CSSD staff. The risk of missing surgical instruments before and after surgery significantly increases in the daily surgical procedures since staff do not always document surgical instruments that are used during surgical procedures. Norton, Martin and Micheli (2012:112) identified miscommunication as the most common cause of missing surgical instruments. Cao's (2015:26) identified that, uncertain environments, intense stress for time, added with long periods of activity increase human error.

According to Phillips (2013:23) in multilingual systems, language barriers, translations, and code switching can be misleading to individuals and processes. These are miscommunication obstacles that very often create chaotic and stressful environments.

Norton, Martin and Micheli (2012:112) identified that lack of communication between OR nurses and CSSD technicians could possibly result in errors in the counting and documentation of surgical instruments. These characteristics are very common in the OR and CSSD setting and justify why surgical instrument counting and documentation practice need detailed attention to ensure patient safety, and to avoid surgical instruments to go missing (Phillips, 2013:23).

De Vries and Rosenberg (2016: 605–613) stated that the dynamics created by formal and informal communication could create a more suitable environment that conveys a greater chance of success with counting the surgical instruments. Furthermore, to prevent missing surgical instruments managers should encourage staff to voice their concerns regarding missing surgical instruments (De Vries & Rosenberg, 2016: 605–613). According to Rowlands and Steeves (2010:410) to prevent missing surgical instruments managers should be proactively discussing methods to improve communication during staff meetings. OR and CSSD managers should schedule a joint meeting at least once a week with OR and CSSD staff (Norton, Martin & Micheli, 2012:112). A joint staff meeting is important to listen to each other‘s concerns and to come up with solutions on how to improve the quality of surgical counting of instruments and how to avoid mislabelling of surgical trays, as well as incorrect counting (Norton ,Martin & Micheli, 2012:112).

2.3.8.3 Heavy workload

According to Cao’s (2015:26 heavy workload can influence the manner how staff count surgical instruments. Working long hours without breaks with additional pressure will increase the possibility of missing surgical instruments and inaccurate surgical trays (Seavey, 2015: 482–485). Management must ensure there is a balance with the schedules for surgery and staff working hours and complete all necessary scheduling without conflict. Overworked, stressed, and disorganized personnel tend to make mistakes, overlook items, and generally rush through the tasks of counting surgical instruments so they can take a break (Cao’s, 2015:26).

2.3.9 Negative consequences of missing surgical instruments

OR and CSSD budgets dramatically increased, due to the time spent looking for the missing surgical instruments (Cao’s, 2015:26), leading to increased hospital stays of patients because of

harm as well as litigation (Norton, Martin & Micheli, 2012:112). At its root, the problem of missing surgical instruments stems from accountability, documentation, and communication (or lack thereof), worsened by the high demand of surgical instruments in OR and in CSSD, and the specific instruments required for a specific surgical procedure.

The storage areas where many surgical instruments are kept have also been found to be often overcrowded, and insufficient for their storage purpose. OR nurses and CSSD technicians often do not know where to locate the items while the surgical instrument is sitting on one of the storage shelves (Seavey, 2015: 482–485). Besides, the litigation proceedings against the institution and disciplinary measures of staff that arise, the crucial complications for the patient should not be underestimated (Cao's, 2015:26).

Blackmore *et al*. (2013:99-105) explained the classification of missing surgical instruments in CSSD that would be identified as negligence as follows: incomplete surgical instrument tray/set, and incorrect packaging labels including incomplete or a disorganized surgical checklist (Cao's, 2015:26). To correct the errors, OR and CSSD managers must create an open-door policy between OR and CSSD. The open-door policy can support a positive transformation of teamwork that could lead to more attentiveness when managing surgical instruments (Phillips, 2013:23).

2.3.10 Counting and documentation procedure in Saudi Arabian public hospitals

According to Phillips (2013:23) in Saudi Arabia public hospitals, the counting of surgical instruments and documentation process in the OR commences prior to the surgery and is repeated during surgery. It is the paramount responsibility of OR nurses to account for surgical instruments before, during, and after every surgical procedure (Phillips, 2013:23).

In Saudi Arabia, the number of surgical instruments is commonly documented on a dry wipe (white) board and the surgical count sheet in the OR (Seavey, 2015: 482–485). It is the OR nurse's responsibility to initiate the counting of surgical instruments and report counting inconsistencies to the OR supervisor for corrective action (Norton, Martin & Micheli, 2012:112). All items used during surgery should be accounted for to ensure instruments have not gone missing (Phillips, 2013:23).

The Joint Commission International Standards (2017:20) asserted that in CSSD, accountability for surgical instruments must be documented in an instrument log tracking. Before the surgical procedure, the CSSD technician will account for all surgical instruments received from the OR

nurse, that will be documented in the instrument logbook (Norton, Martin & Micheli, 2012:112). After the cleaning process each surgical instrument will be counted and documented on the count sheet. After the sterilization process, the CSSD technician will count and document each surgical instrument set/tray, and documentation will be done in the instruments logbook.

2.3.11 Best practice policies

Differences between patient safety action steps and inconsistent staff adherence to these action steps were identified (Norton, Martin & Micheli, 2012:112). Timing of counting and documentation includes the following: the initial and closing of the surgical procedure, and before and after cleaning and the sterilization process must be standardized. (Barimani, *et al.,* 2020:7-16). Guidelines for the counting of surgical instruments at the following times are recommended in OR: before the start of the procedure, before and after the closure of a cavity, before wound closure begins, at skin closure, and at the time of permanent relief of the OR nurse (The Joint Commission International Standards, 2017:20). In CSSD it is the following: before the decontamination process, after the cleaning process, after sterilization and before surgical instruments will be delivered to OR (Phillips, 2013:23).

2.3.12 Quality assurance measures: organizational policies for counting and documentation

Goldberg and Feldman (2012:207) conceded that accountability and documentation of the procedure is a critical practice. A standardized procedure of patient care and the reinforcement are recommended to ensure OR and CSSD staff comply. Standardizing and reinforcing counting and documentation practices have proved to decrease the missing of surgical instruments (Phillips, 2013:23).

2.3.12.1 Avoidance of variation in counting and documentation practice

According to Phillips (2013:23) various counting and documentation practice procedures may have the risk of surgical instruments going missing, especially when staff do not adhere to the standardized counting and documentation. Standardizing the counting and documentation procedures reduces the risk of missing surgical instruments and allows for continuity and efficiency within the OR and CSSD (Norton, Martin & Micheli, 2012:112). Monitoring the rigorous adherence to hospital policy, pertaining to surgical instrument counting and documentation will lead to best practice (The Joint Commission International Standards, 2017:20).

2.3.12.2 Accountability of OR nurses and CSSD technicians

According to Norton, Martin and Micheli (2012:112) promote renewed accountability of the OR nurses and CSSD technicians for precise accountability and documentation to prevent poor practice. Nonadherence to policy and deviation are unacceptable (The Joint Commission International standards, 2017:20).

2.3.12.3 Training

Reinforcing the surgical instrument accountability and documentation ensures standardization of procedures for missing and inaccurate surgical instruments (Edel, 2012:236).

It is imperative for the OR nurse and CSSD technician to know at which stage of the surgery, cleaning and sterilization processes, counting and documentation should be performed (The Joint Commission International Standards, 2017:20). An established policy that provides standards as to when counting and documentation should be done during surgery, cleaning and sterilization process, with the aim of not interrupting the surgical procedure will support this knowledge (Norton, Martin & Micheli, 2012:112). Standardizing the counting and documentation procedure includes the following: the initial and closing counting, which is before and after the cleaning and sterilization process (Goldberg & Feldman, 2012: 207).

2.3.12.4 Performance evaluation

Staff competency must be evaluated continuously to ensure adherence to hospital policy (Goldberg & Feldman, 2012: 207). Furthermore, the Joint Commission International Standards (2017:20) suggested a regular review of policies, at least every two years to identify opportunities to update education of interventions.

2.3.12.5 Regular audits

Each institution is responsible to measure compliance in accordance with standardized practice (Norton, Martin & Micheli, 2012:112). To ensure compliance of stipulated policy guidelines, supervisors of the institution should regularly review and evaluate existing policies (Goldberg & Feldman, 2012: 207). The review and reporting of discrepancies should occur with OR nurses and CSSD technicians giving their input. OR nurses and CSSD technicians are required to report discrepancies to their supervisors during any stage of the counting and documentation process. Supervisors must create an environment of transparency whereby staff can report missing surgical instruments immediately to avoid the negative impact on patient safety. The

steps to retrieve the missing item immediately should be listed in the accountability and documentation policy (Seavey, 2015: 482–485).

According to Goldberg and Feldman (2012: 207) managers should inform staff with regular updates of the quality assurance measures. The quality assurance measures updates should keep staff up to date with counting practices and how to improve the existing practice in the OR and CSSD (Seavey, 2015: 482–485). According to the Joint Commission International standards (2017:20) managers should develop an environment whereby staff should know the importance to quality assurance measures and to count surgical instruments as per policies.

2.4 Summary

A discussion was provided on literature regarding the management of surgical instruments in CSSD and in OR. The international and national policies reflect the importance of adhering to the correct counting and documentation practices to support patient safety. However, the inconsistency of practice and work dynamics in OR and in CSSD appear to contribute to inaccurate surgical trays and missing surgical instruments.

Extensive literature (The Joint Commission International standards 2017:20; Hung & Lin, 2015:104; Shriyan, 2015:7-16; Edel, 2012:229; Sukhlecha, et al., 2015: 1-6; Zheng, Hu, & Xin ,2016: 2469–2477; Goldberg & Feldman, 2012: 207) exists on the management of surgical instruments in CSSD, surgical instrument counting, and documentation practices. However, limited literature exists regarding experiences of CSSD and OR staff in relation to missing surgical instruments, within Saudi Arabia.

In the next chapter a description of the research process is presented.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

In Chapter 3, a comprehensive explanation is provided of the research methods used to explore the experiences of OR nurses and CSSD technicians in relation to missing surgical instruments and inaccurate surgical trays at a public hospital. Specific skills and processes in recognizing, choosing and analysing the details of the subjects were applied. According to Libguides (2019:1) a research study can be evaluated completely after reading the methodology section. A qualitative research approach was applied to explore the experiences of OR nurses and a CSSD technician in relation to missing surgical instruments and inaccurate surgical trays.

3.2 Aim and objectives

The research aimed to explore the experiences of CSSD and OR staff in relation to missing surgical instruments and inaccurate surgical trays.

3.3 The objectives of this research were:

- To demonstrate an understanding of the current counting practices of surgical instruments of OR nurses and CSSD technicians.
- Describing the experiences of CSSD technicians and OR nurses in relation to quality assurance measures that serve to prevent the loss of surgical instruments and the presence of inaccurate surgical trays.
- Exploring the experiences of OR nurses and CSSD technicians in relation to inaccurate surgical trays and missing instruments.

3.4 Study setting

According to Brink, Van der Walt and Van Rensburg (2015:59) a study setting is “a specific place or places where data is collected”. The data was collected in a natural setting. Grove, Burns and Gray (2013:373) postulate that for the sake of the research this environment must not be manipulated or changed.

Collection of data was done at two public hospitals in the Eastern Region of Saudi Arabia. The two hospitals were selected as both are military hospitals and both hospitals report to the same hospital management team. The hospitals serve the members of the military forces, their dependents and hospital personnel. There are five operating rooms in each hospital. All

operating rooms function twenty-four hours, seven days a week. Surgical procedures that are conducted include general, pediatric, urology, neurology, ear nose and throat, gynecology, maxilla facial and dental surgery. Between 330 and 350 procedures are completed monthly at both the public hospitals.

Each hospital as a CSSD where instruments are decontaminated, inspected, packed, and sterilized. The CSSD functions twenty-four hours, seven days a week. Between 21000 to 23000 surgical instruments are processed monthly at both the public hospitals.

Due to the COVID -19 pandemic, virtual Microsoft Team interviews were done before the onset of interviews after consulting with the managers of OR and CSSD .

3.5 Research design

Lambert and Lambert (2012) relate that a descriptive qualitative design assists in uncovering the nature of events e.g. to describe how certain things/a phenomenon happened. The current study concerned a need to discover why missing instruments went missing irrespective of the implementation of quality assurance measures. It is acknowledged that the use of quality assurance measures assisted in reducing the numbers of instruments that went missing but the process was slow (see Section 1.4, Research problem). The descriptive qualitative design was therefore considered suitable to explore why instruments go missing between the OR and the CSSD. Subsequently, semi-structured individual interviews were conducted with eleven participants.

According to Grove, Burns and Gray (2013:23) a qualitative study is “an interactive, subjective, holistic approach used to describe life experiences’’. The insights gained from these individual interviews were used to describe the experiences of CSSD and OR staff in relation to missing surgical instruments and inaccurate surgical trays at the study setting.

3.6 Population and sampling

The collection of people or objects who fall within the parameters of the criteria for the research is seen as a population (Brink, Van der Walt & Van Rensburg, 2015:131). The population relates to all CSSD technicians and OR nurses involved with the management of surgical instruments employed for more than one year at the two public sector hospitals of the Middle Eastern region.

A sample refers to a group of the chosen individuals, who are to participate in the intended study (Grove, Gray & Burns, 2015:249-250). Sampling is when the researcher decides on which individuals will participate in the research study as indicated in Grove, Gray & Burns (2015:37).

This study only focused on OR nurses and CSSD technicians who have worked for more than one year at either OR and the CSSD.

The chosen group had experiences of a deeper understanding of the topic, concerning missing surgical instruments and inaccurate surgical trays in CSSD and OR.

At some point data collected reaches saturation that comes from the grounded theory to stop collecting data when no further insights can be gained. At this stage, new data no longer provides more insights or reveals new properties (Creswell, 2014:191). In the current study, upon the completion of ten interviews, it was clear that participants related similar information and that the completion of more interviews might not necessarily lead to new information. It was therefore concluded that data saturation was reached. The field worker conducted the eleventh interview to ensure no new information emerges. The final sample therefore comprised n=11 participants, i.e. 06 OR nurses and 05 technicians from CSSD.

3.6.1 Inclusion criteria

Grove, Burns and Gray (2013:353) indicated that inclusion criteria include the qualities displayed in the population to gain information for the research study. The criteria included all OR nurses working in the OR and all CSSD technicians working in CSSD. All the participants in the research settings were knowledgeable in OR and CSSD and registered as technicians and nurses with Saudi Commission for Health Specialties (SCHS) as required by the Saudi Ministry of Labour. All potential participants worked in OR and CSSD respectively for at least one year. Language was not considered an inclusion criterion, as all staff, although from different countries and cultures, converse in English at the hospitals under study.

3.6.2 Exclusion criteria

Grove, Burns and Gray (2013:353) refer to exclusion criteria as “characteristics that can cause a person or element to be excluded from the target population and justification should be provided for excluding participants”. The CSSD technicians and OR nurses who were on annual and sick leave were excluded.

3.7 Instrumentation

The way or method used by the researcher to obtain data from participants, to complete a study, refers to instrumentation (Grove, Gray & Burns, 2015:44). A semi-structured interview guide was the instrument used to reach the study objectives.

The researcher developed the interview guide (**Appendix 5**) contained open-ended questions, to allow the participants to provide an in-depth view of the phenomenon. Each interview commenced with an initial open-ended question: “Tell me about your experiences in relation to missing surgical instruments and inaccurate surgical trays”.

3.8 Pilot interview

A pilot study is fundamental to recognize and address some of the problems that may be encountered during the research process, and to make adjustments about the instrument or re-assess the achievability of the study (De Vos, *et al*. 2013:237). A pilot interview was conducted to refine the questions of the interview guide and the skills of the interviewee such as “listening, reflecting, probing, paraphrasing and summarizing” (Grove, Burns & Gray, 2013:343).

One participant from OR was interviewed for the pilot study who met the inclusion criteria. The study supervisor scrutinized the skills of the interviewer and gave advice. No changes were made to the questions in the interview guide as all were clear. The data collected was included for the data analysis.

3.9 Trustworthiness

Trustworthiness is a confirmation that a qualitative study is meticulous, and of high standards. It is the extent to which the research process and findings of a qualitative study are considered credible, transferable, dependable, and confirmable (Grove, Gray & Burns, 2015:392).

3.9.1 Credibility

This refers to the truthfulness of data. Lincoln and Guba (1985: cited in De Vos *et al.,* 2013:420) outline the “different strategies for increasing credibility in qualitative research”, such as “prolonged engagement and persistent observation in the field”. Fieldnotes are a written account of what the fieldworker hears, sees, experiences and thinks about during the interview (De Vos *et al*., 2013:359). The participant’s body language and gestures that were indicated assisted the researcher in analysing the data.

In order to underpin whether the data was believable or credible and valid, a process of peer debriefing was followed so that everything could be verified. This was achieved by comparing the interpretations of both the researcher and the fieldworker.

The verbatim transcription of the recorded transcriptions provided for internal validity. In addition, the fieldworker's notes taken during and immediately after interviews of what the participant said or meant, represented the accuracy.

3.9.2 Transferability

Brink, Van der Walt and Van Rensburg (2015:173) see transferability as "the generalizing and the ability to relate the findings to other contexts or to other participants. To improve transferability, a purposive sample was used to understand participants' experience in detail. By using a purposive sample, the range of information by consciously selected participants is maximised in terms of their knowledge of the phenomenon under investigation (Brink, Van der Walt & Van Rensburg, 2015:173).

3.9.3 Dependability

The term dependability is about the "stability of data over time" (Brink, Van der Walt & Van Rensburg, 2015:173). Guba and Lincoln (1985) in Brink define dependability as "the extent to which similar results would be attained if the study were to be repeated". The researcher ensured that the methods were described in explicit detail for the sake of dependability by maintaining an "audit trail". All raw data is stored so that it is available for review if requested. As the study progressed, the information was documented, as well as the conclusions and the incentive on which each decision was based (De Vos *et al*., 2013:422). The supervisor made sure that the information was accurately captured, recorded, documented and verified. The supervisor closely supervised every stage of the study. To address dependability more truthfully, the researcher used a digital recorder to ensure that all the information provided by the participants were recorded (Brink, Van der Walt & Van Rensburg, 2015:173). The inquiry auditor, a peer, determined whether the process and procedures used in the study were acceptable. Furthermore, the supervisor assessed the coding of randomly selected transcripts to gauge for over- or under-coding, to prevent over interpretation of data or the lack thereof. Agreement was reached between the researcher and the supervisor on the identified themes.

3.9.4 Confirmability

Evidence was provided that confirmed the findings and the interpretation by auditing (De Vos e*t al.*, 2013:420). Peer review verification of data by the study supervisor involved the auditing of recorded materials, transcripts, a question route, a list of participants, and an explanation of theoretical, methodological and analytical decisions that were made (De Vos *et al*., 2013:420). The researcher enhanced this by practising identification and explicitly avoiding her experiences from influencing the voices of the participants.

An audit trail of the research process was kept which was a systematic process of documentation describing what and how it was discovered. It provided an analysis of all decisions taken during the research process (De Vos *et al.,* 2013:422).

3.10 Data collection

A virtual meeting was held to which fifty-six staff members from the two hospitals were invited. The purpose and nature of the study was explained and their rights in terms of their participation were clarified.

The fieldworker met virtually via Microsoft Teams with the participants who agreed to participate at a time that was convenient for them, using a semi-structured interview guide.

Interviews were conducted from 06 of July to 28 July 2020. Each participant signed an agreement to be interviewed and recorded. The interviews were conducted in English, the official language. The participants' names were coded numerically in the transcriptions of the interviews. All interviews were audio-recorded and fieldnotes were kept of the unstructured observations (Polit & Beck, 2018:404). To secure data in the event of technical failure, two recording devices were used for each interview.

3.10.1 The interviews

An introduction of the study topic and the objectives were explained to gain permission. Upon agreement to participate, the consent form was signed. To ensure the participant's confidentiality, the researcher applied participant codes. In-depth individual interviews were done, to discover the experience of OR nurses and CSSD technicians in relation to missing surgical instruments and inaccurate surgical trays. Data was collected by a fieldworker through one-on-one virtual Microsoft Team interviews.

The interviews were recorded using a digital voice recorder and the recorder on the Microsoft Teams to make certain that all data was captured.

The interview session for each participant was scheduled at a time they considered convenient. They agreed to be interviewed after their working hours and not in the vicinity of the workplace. Cell phones of the interviewer and participants were switched off or on silent mode, to minimize possible interruptions (Grove, Burns & Gray, 2013:272-273). Each interview lasted between 45 to 60 minutes. Probes were used during the interview to obtain more information from the participant about the response to a particular interview question or discussion by the participant. In total 11 interviews were completed.

Participants were thanked and a gift to the value of one hundred rand (ZAR 100.00) was given to each, as a token of gratitude for their time to participate in the research.

Interview technique: The researcher had previously received training by her supervisor on conducting interviews using the technique of reflection explained by Carl Rogers (Boeree, 2006). The technique required the interviewer to listen attentively to the participant and endeavor to summarize and reflect the message back to the participant. According to the founder of this technique, Carl Rogers, the act of reflecting the message back to the participant enables the interviewee to reconsider the initial message as well as the interpretation thereof by the interviewer. The interviewee thus can rectify incorrect interpretation. Reflecting a message back thus contributes to the truthfulness of the data. The researcher attended a workshop on interviewing skills where her ability to interview participants were assessed in a role-play situation.

The fieldworker has a master's in nursing degree and has previously engaged in interviewing using the technique of reflection explained in the previous paragraph, and qualitative research. The field worker's interviewing skills were assessed by the supervisor via Microsoft team meeting prior to the pilot interview and the commencement of data collection. The decision to use a field worker was made due to the researcher's familiarity with the OR nurses and CSSD technicians.

3.11 Ethical considerations

The Stellenbosch University, Health Research Ethics Committee granted permission for the research to be conducted. The management of the two public hospitals in the Eastern Region of Saudi Arabia also gave their approval. According to Brink, Van der Walt and Van Rensburg

(2015:34), “the researcher has the responsibility to respect and protect the human rights of the participants during research”. The researcher abided by the following ethical principles.

3.11.1 Informed consent and voluntary participation

The participants provided written informed consent for participation in the study and the recording of the virtual interview (Appendix 4). Participants were also informed that they are free to cancel participation at any time during the study without any consequences as advised by Grove, Gray and Burns (2015:177).

3.11.1 Right to self-determination

Withdrawing would not affect them negatively, participation was voluntary. Furthermore, participants could ask the field worker questions about the study and it was important for them to feel easy in mind (Grove, Gray & Burns, 2015:101).

3.11.2 Right to confidentiality and anonymity

The participants’ right to confidentiality of information was ensured, as interviews were carried out at a pre-arranged private and secure venue; the participants were given aliases to ensure anonymity. All transcriptions, participant information leaflets and signed consent forms are electronically stored for five years and protected by a password of the researcher. Participants received a copy of the signed participant information and consent form. The transcriber and the fieldworker signed a privacy and confidentiality agreement to ensure that all information concerning the participants was confidential. These are also kept in a locked safe for a five-year period, only accessible to the researcher.

3.11.3 Right to protection from discomfort and harm

The comfort of participants and their safety was ensured by applying the principle of beneficence. Microsoft Team virtual interviewing took place at an appropriate time and at a place without interrupting their work schedule.

3.12 Data analysis

Six phases of thematic analysis were applied (Braun & Clarke, 2012).

Figure 3.1 illustrates the phases

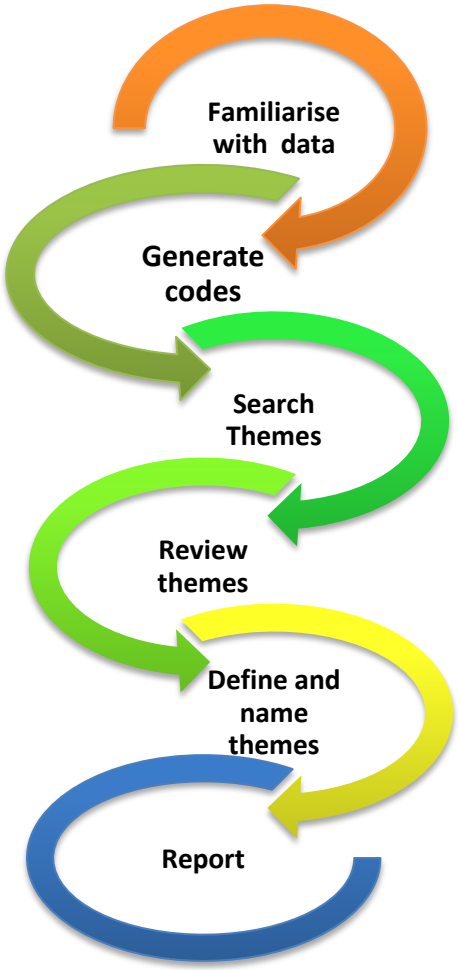


Figure 3.1: Phases of thematic analysis (Adapted from Braun & Clarke, 2012).

3.12.1 Braun and Clarke's six phases of thematic analysis

3.12.1.1 Phase 1: Familiarising of the data

This process entailed the listening of the recordings and checking the transcripts. Thereafter, the researcher familiarised herself with the data by reading the completed data set. Then the researcher fully immersed herself in the data by reading and re-reading, as suggested by Braun and Clarke (2012). By re-reading, the researcher could start to search for meanings and patterns in the data. Braun and Clarke (2012) stated that although the reading and re-reading can be very time consuming the immersion in data is very important, to become more familiar with the complexity of the data. During this phase, labelling certain phrases or words as potential codes was started.

3.12.1.2 Phase 2: Generating initial codes

After familiarization of the data and identification of initial ideas about what stood out, the generalisation of initial codes took place. Similar ideas were grouped together to form codes. A code can range from a single word, phrase(s) or full sentences (Saldaña, 2015:4-15) and represents a summary of an idea in the data. Coding is a frequentative process and requires a few rounds of coding and re-coding to reach the final set of codes (Saldaña, 2015:4-15).

The following diagram in figure 3.2 gives an overview of the code-generating process adapted from Saldaña (2015:4-15).

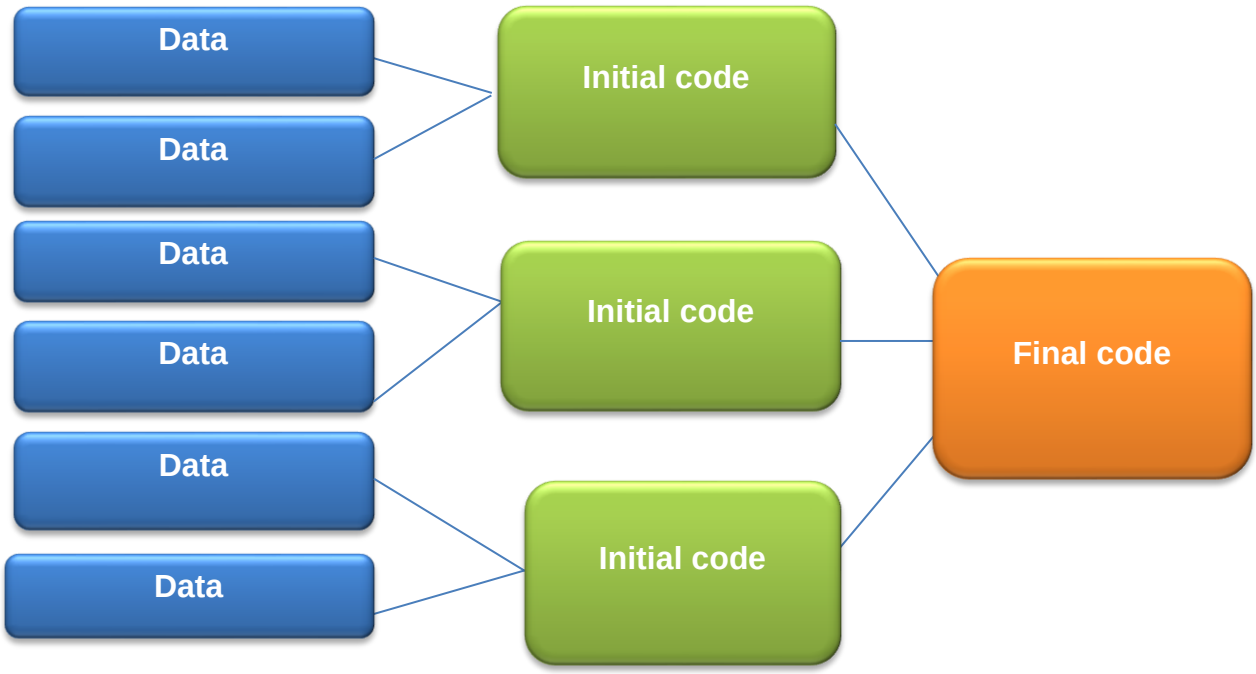


Figure 3.2: Overview of the code-generating process

The responses on each question for a complete viewpoint of each question were grouped. Initial codes were then assigned to the relevant data and analysed, and similar codes were condensed into a more descriptive code. After several rounds of coding, a final code was created for the complete data set. The final codes were grouped together according to relevance and finally generated three groups of codes that referred to related issues. The three groups were condensed further into shorter descriptive codes. The data analysis was completed manually by the researcher.

3.12.1.3 Phase 3: Searching for themes

The search for themes proceeded by combining codes into potential themes and gathering more data relevant to the themes (Braun & Clarke, 2012). This can only be done after completing coding and having a list of different codes. According to Braun and Clarke (2012) there are "various ways that can help identify themes of which visualization is one". One can make use of colour-coded tables to get an idea of emerging themes visually. The codes resulted in themes being identified of the phenomenon under study, the meanings originated from the descriptions given by the participants. A theme name was assigned to each of the groups, thus ending the process by having six main themes, each with sixteen subthemes.

The following diagram in Figure 3.3 gives an overview of the theme-generating process as adapted from Saldaña (2015:9)

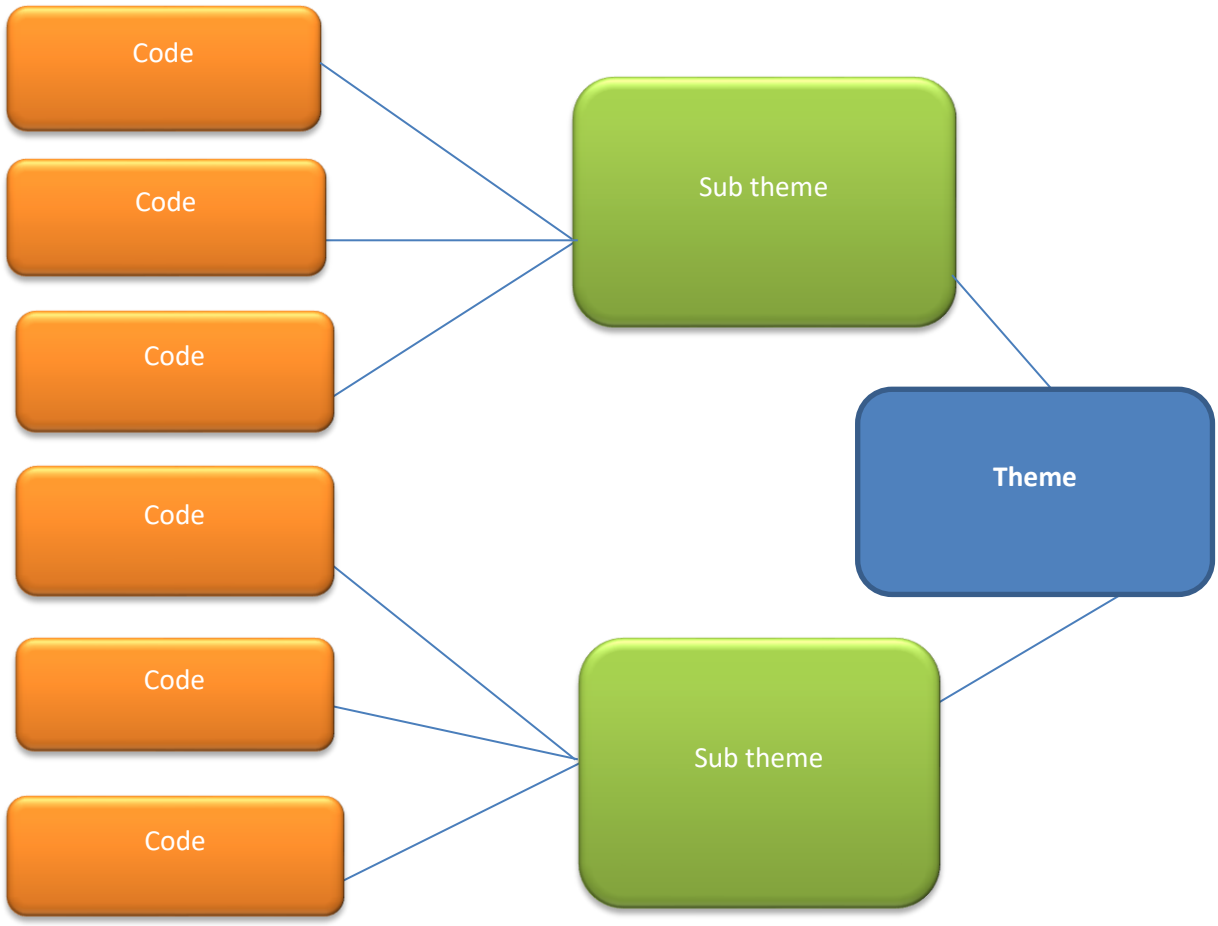


Figure 3.3: Overview of the theme-generating process

3.12.1.4 Phase 4: Reviewing themes

The themes were evaluated to make sure that the themes refer to the codes, as well as the complete data set (Braun & Clarke, 2012). According to Braun and Clarke (2012), themes may be broken down into new themes re-evaluated, or grouped together. The themes were reviewed and refined to ensure the complete data set had been analysed. The researcher re-read the entire data set during this phase to ensure that the themes reflect the data and to code any additional data that could have been missed during the initial coding process. After the completion of this process, no extra information was identified.

3.12.1.5 Phase 5: Defining and naming themes

This phase includes the naming and describing of each theme by constantly analyzing and refining the themes (Braun & Clarke, 2012). The researcher reached a fundamental understanding of the relevant themes and could link the different aspects to each theme. Further refining helped to identify subthemes and possible larger or more complex themes (Braun & Clarke, 2012). Each theme could be provided with a relevant description making clear theme definition possible.

3.12.1.6 Phase 6: Producing a report

This phase led to the final analysis and writing of the report. The researcher had a complete set of themes with descriptions and started drawing up the final report. The aim of the report is to provide “a brief, understandable and thought-provoking account of the story about the data” (Braun & Clarke, 2012). According to Braun and Clarke (2012) the report should not only be a description of the data analysed and findings, but also connect the findings to the research question.

3.13. Summary

A qualitative approach with a descriptive study design was applied. The objectives were about: understanding current counting practices of surgical instruments of OR nurses and CSSD technicians, to describe the experiences of CSSD technicians and OR nurses in relation to quality assurance measures that serve to prevent the loss of surgical instruments and the presence of inaccurate surgical trays, and to explore the experiences of OR nurses and CSSD technicians in relation to inaccurate surgical trays and missing instruments. The research methodology of the study was discussed which included various phases of the research process.

Six steps of data analysis as advised by Braun and Clarke were used to explore the experiences of OR nurses and CSSD technicians in relation to missing surgical instruments and inaccurate surgical trays. The trustworthiness of this study determined that the study is rigorous and of high standards. Furthermore, a detailed discussion of the ethical principles was presented. The next chapter consists of the findings of this phenomenon.

CHAPTER 4: FINDINGS

4.1 Introduction

In this chapter the findings of the research study are presented. The aim was to understand the experiences of OR nurses and CSSD technicians in relation to missing surgical instruments and inaccurate surgical trays. Raw data were transcribed verbatim. Thereafter, the 6-step data analysis process as described by Braun and Clarke was applied.

4.2 Section A: Biographical data

The nurses who participated in the study comprised of 6 females. All participants had an undergraduate qualification and a postgraduate diploma in Operating Room nursing and are registered with the Saudi Commission for Health Specialties to practice in Saudi Arabia. Their ages ranged between 30-50 years.

The technicians comprised of 2 females and 3 males who participated in the study. All participants had an undergraduate qualification in sterile processing and are registered with the Saudi Commission for Health Specialties to practice in Saudi Arabia. Their ages ranged between 30-50 years.

4.3 Section B: Themes emerging from the interviews

Six main themes and sixteen subthemes emerged from the data. The main themes concern participants' efforts to adhere to surgical counting policies and procedure and quality assurance measures. Issues relating to surgical instrument counting processes, managerial support, miscommunication between OR and CSSD staff and educational support. The themes and subthemes that emerged are displayed in Table 4.1.

Table 4.1: Themes and subthemes that emerged

Themes	Subthemes
1. Adhering to surgical counting policies and procedures:	• International standards for counting process • Educate staff to enhance compliance to organization policies and procedures • Education not effective

	• Strengthening new knowledge
2. Adhering to quality assurance measures:	• Regular updates of quality assurance measures • Oblivious to regular updates of quality assurance measures • Adherence influenced by workload
3. Surgical instruments counting process:	• Surgical instrument counting during sterilization process • Surgical instrument counting during surgical procedures • CSSD provides incomplete trays not labelled as such • Conflict over poor counting practice
4. Managerial support	• Management to listen to the staff • Culture of blame
5. Miscommunication between OR and CSSD	• Miscommunication between OR and CSSD augments the misplacement of instruments • Language barriers contribute to miscommunication • Unilateral meetings of CSSD technicians and OR contribute to miscommunication
6. Educational support	

4.3.1 Theme 1: Adhering to surgical counting policies and procedures

OR nurses and CSSD technicians described surgical instruments counting policies and procedures as the most important guide to ensure that surgical instruments are counted accurately. Participants also stated that it is important that all staff in OR and CSSD must adhere to these policies and procedures to avoid missing surgical instruments and inaccurate surgical trays.

4.3.1.1 *International standards for counting process*

It is imperative for OR nurses and CSSD technicians to adhere to international standards according to the JCI and AORN (Chapter 2, Section 2.3.1), to ensure that the practices are adhered to accurately. Both OR nurses and CSSD technicians indicated that all staff working in OR and CSSD should adhere to international and organizational surgical instrument counting standards and procedures. The organizational and international standards and procedures for surgical instrument counting should help staff to be more knowledgeable to provide complete and accurate surgical instruments. The purpose of the international standard and procedures is to provide an outline that OR and CSSD team managers can use to develop and implement policies and procedures for surgical instrument counts.

*"Remember we (OR and CSSD staff) are guided by our organization surgical instrument counting policies and procedures and firstly with international standards and procedures which is the Association for Operating Room Nurse Standard (AORN) standard and JCI. The international standards and procedures allows OR and CSSD managers to develop organizational surgical counting policies and procedures". (*Participant 1, OR nurse).

4.3.1.2 Educate staff to enhance compliance to organizational policies and procedures

Both public hospitals ensure that education regarding new policies and procedures are taking place to enhance compliance. The OR and CSSD managers have assigned one of the senior staff in the department to educate the new staff about the organizational and international policies and procedures.

> *"… when they (new staff) arrive in the CSSD, the manager will assign a senior staff to educate the new staff about the counting policies." (Participant 3, CSSD technician).*

4.3.1.3 Education not effective

Irrespective of the mentioned training regarding compliance to organizational and international standards, some participants indicated that surgical instruments are misplaced because a staff member does not know these organizational and international counting standards/policies.

> *"…The reason that surgical instruments are missing is because OR and CSSD staff do not know these international standard." (Participant 1, OR nurse).*

…"New staff members do receive departmental training and hospital orientation during the first three months of their contract. They (new staff) also received education about the organizational surgical counting policies and procedures. They must read and understand all these policies and procedures before starting with any assigned tasks to them." (*Participant 7, CSSD technician*).

4.3.1.4 Strengthening new knowledge

Some participants stated that the managers have no follow-up meetings after orientation with new staff to ensure the staff fully understand the surgical instrument counting policies and procedures.

"But after the orientation this is when we (CSSD technician) will see that the new staff do not count the instruments as per international standards and this is how the instruments are missing and inaccurate. The manager must follow up on the new staff education after orientation to see if they count correctly and as per standards, but they do not follow up." (Participant 3, CSSD technician).

4.3.2 Adhering to quality assurance measures

Both public hospitals have established quality assurance measures, i.e. counting documentation and surgical instruments count checklist audit tools, for the processing and counting of surgical instruments. These quality assurance measures outline and emphasize the organization's views and values pertaining to the processing and counting of surgical instruments. Adhering to these quality assurance measures, confirm that employees understand their role and help to reduce or eliminate mistakes while counting surgical instruments.

4.3.2.1 Regular updates of quality assurance measures

Quality assurance measures are regularly reviewed to ensure that staff and methodologies are updated based on current practice requirements, knowledge, and technology. Both public hospitals update their quality assurance measures every two years, unless there is crucial information available that requires a more immediate update. The updated information about quality assurance measures should assist OR and CSSD staff to be more vigilant about missing instruments and practicing the correct counting methods. Participants voiced that they are not informed about any updated information concerning quality assurance measures that can assist OR nurses and CSSD technicians to avoid the misplacement of surgical instruments. Therefore, staff tend to continue to count surgical instruments incorrectly.

"...Only problem is that I am not aware if there will be updated information to the quality assurance measure that is why we cannot see improvement in the OR. Therefore OR nurses will continue not to count the surgical instruments as what is expected of them (OR nurses), well clearly OR nurses do not count and this is why surgical instruments are missing, because it is not documented on the surgical checklist according to the quality assurance measures." (Participant 8, OR nurse).

"Each department must update their policies and procedures every two years to ensure that staff is updated with all evidence practice according to JCI. The quality assurance will be verified by the senior management of the hospitals before information will be shared with the rest of the staff in OR and CSSD." (Participant 11, OR nurse).

4.3.2.2 Oblivious to regular updates of quality assurance measures

Participants voiced their dissatisfaction regarding being unaware of the regular updates of the quality assurance measures. Most participants stated that the managers must address this oversight. The regular updates should assist the OR and CSSD staff to provide the best quality services. However, according to them the quality of counting surgical instruments is non-existent. Furthermore, one participant stated that he witnessed his colleague not counting the surgical instruments.

"But the staff in CSSD do not adhere to the counting practice because instruments are missing, they (CSSD staff) do not know about the updated information in regards to the quality assurance." (Participant 2, CSSD technician).

4.3.2.3 Adherence influenced by workload

Although the quality assurance measures are in place, workload can affect counting practices and therefore lead to mistakes and missing surgical instruments. Workload examples may include when either OR/CSSD is busy, meaning staff not taking their breaks and standing for long hours, and staff covering shifts for staff members who are on sick or annual leave. These high workloads and extra shifts may cause burnout and influence the quality outcomes of surgical counting practices.

"You know, especially in the busy times (when the workload is heavy), you know, people get fatigued, we (OR staff) have to work so hard that most of the time we do not count surgical instrument and do not think about quality assurance measures, maybe we

do not care about quality assurance measures because we are too tired." (Participant 9, OR nurse).

4.3.3 Surgical instruments counting process

CSSD technicians and OR nurses described that they should count surgical instruments four times before and after the sterilization process, and before and after each surgical procedure. The surgical instruments counted in CSSD and OR should be meticulously checked to ensure the completeness of the surgical set/tray for each individual patient procedure. Several participants indicated that the surgical trays tend to be incomplete and that staff do not adhere to counting policies. These issues are discussed below.

4.3.3.1 Surgical instrument counting during sterilization process

Participants asserted that surgical instrument counts are incorrect and inconsistent, irrespective of the presence of the counting policies and procedures. Most participants identified that the reason surgical instruments are reported as missing, is due to staff not counting the surgical instruments during the sterilization process in CSSD. The current practice at both public hospitals is that CSSD technicians should count the surgical instruments in pairs to verify completeness. Participants stated that CSSD technicians are in a hurry to get the job done and do not count surgical instruments in pairs.

"We (CSSD technicians) just want to get the job done and at times your partner is out of the unit, then I will count alone during the sterilization process. Therefore, I will say the surgical count will not be complete. Because nobody will verify the completeness of the tray, and this is how we lost surgical instruments." (Participant 5, CSSD technician).

Another participant stated that most CSSD technicians are careless and do not count and document the surgical instrument counting before and after sterilization process.

"They (CSSD technicians) display reckless behaviour, when we (OR nurses) ask for a complete instruments tray, they will not know where the instruments are. The CSSD technicians never count and always misplace the instruments." (Participant 9, OR nurse).

4.3.3.2 Surgical instrument counting during surgical procedures

OR nurses should count and inspect the surgical instruments thoroughly before and after surgical procedures. During the surgical procedure, surgical instruments counting should be

documented on the surgical instrument checklist to ensure correct documentation. Upon opening the tray in OR, two OR nurses must check the surgical instrument tray/set, name the instrument verbally and then place a tick next to the name of each instrument on the checklist. Participants indicated that OR nurses do not adhere to the practice and when surgical instruments are not counted, it will easily be declared as missing or end up in the garbage bins.

> *"…OR nurse will not check the sets according to the checklist, and this is how the instruments are getting lost in OR. Our nurses can be careless as well you know… they do not count or check", subsequently when nobody count the surgical instruments of course surgical instruments will be missing or end up in the garbage bins, and this normally happened."(Participant 6, OR nurse).*

Participants expressed their dissatisfaction about OR nurses' inadequate counting of the surgical instruments and furthermore, how surgical instruments end up in the garbage bins.

> *"During the surgery the nurse will not count the instruments and the instruments will end up in the garbage bin because they are careless, and after the surgery this is when they (OR nurses) realize that the surgical instruments is missing, this shows that instruments are missing because OR nurse do not count the surgical instruments." (Participant 7, CSSD technician).*

4.3.3.3 CSSD provides incomplete trays not labelled as such

OR and CSSD staff from both public hospitals need to adhere to the counting policies and procedures for surgical instruments. For example, the counting of the surgical instruments should be completed according to the size of the surgical instrument. Furthermore, each surgical instrument is being checked and marked off on the surgical instrument checklist to ensure completeness of the surgical instrument tray before and after each surgical procedure, as well as before and after the cleaning and sterilization processes. The findings suggest that staff members at CSSD are inconsistent in marking the surgical instrument count on the checklist and that OR nurses would receive a tray, that when upon opening it in OR, will realise that the tray is indeed incomplete.

> *"When we (OR nurses) are going to open a surgical instrument tray we will see that the instruments tray are incomplete and that the surgical checklist was not ticked off as per the counting policy" (Participant 10, OR nurse).*

4.3.3.4 Conflict over poor counting practice

Most errors were identified during surgical instrument counting where OR and CSSD staff were not taking the accountability with counting surgical instruments according to counting policies. Differences in counting, the manner of documentation and the individual approaches increase the risk of missing surgical instruments and inaccurate surgical trays. It seems that surgical instruments can go missing during the cleaning and sterilization processes and these missing instruments are not documented on the checklist, due to poor surgical instrument counting practice. Participants also mentioned that conflict between OR nurses and CSSD technicians arise when staff blame one another for these poor counting practices and improper recording of the surgical instrument count.

> *"… OR nurses do not take the responsibility to count the surgical instruments. After the surgery procedure they (OR nurses) will call CSSD technicians and claimed they never received that instruments. Most of the times instruments in OR cannot be found because nobody count or documents the instruments." (Participant 7, CSSD technician).*

One participant acknowledged being blamed by the CSSD technicians when a surgical instrument went missing.

> *"CSSD technician blamed me for missing surgical instruments, and during this conflict we do not realize that just have to count the surgical instruments correct. Yes both of us. OR and CSSD staff must count the surgical instruments. This will help to avoid missing surgical instruments." (Participant 8, OR nurse).*

4.3.4 Managerial support

The findings suggest that the managers in OR and CSSD, at both public hospitals, should provide staff the opportunity to verbalize their concerns and be more supportive.

4.3.4.1 Management to listen to the staff

The OR and CSSD managers scheduled meetings each morning with their staff to discuss safety issues in the departments, namely missing and inaccurate surgical instruments/tray. However, several participants indicated that they are not given an opportunity to talk during these meetings.

"And every morning we (OR team) have morning meeting where the managers we talk about missing instruments and what staff should do, normally staff do not talk about their concerns." (Participant 6, OR nurse).

"Talk, talk, the manager talk and staff just listen we do not stay much during meeting." (Participant 7, CSSD technician).

OR and CSSD staff feel that they are not given the opportunity to express their frustration regarding missing surgical instruments. Most participants indicated that the environment is non-supportive and that the managers do not listen to their frustrations.

"I think our managers must give us (staff) the opportunity to talk during meetings, they (managers) can nurture a culture of a two way communication meaning encouraging staff to talk about incorrect counting practice and the frustration." (Participant 2, CSSD technician).

4.3.4.2 Culture of blame

Furthermore, some participants stated that they normally get the blame if surgical instruments are misplaced or inaccurate.

"…OR and CSSD managers always blame the staff, they never listen to the staff concerns but we try not to stress yourself, to try to do the work, and to remind each other to count the surgical instruments correctly. If our staff can count the surgical instruments then we will not have missing instruments and perhaps the managers can support staff to follow the right procedures." (Participant 2, CSSD technician).

4.3.5 Miscommunication between OR and CSSD

The OR and CSSD manager's collaboration with the nursing education departments communicate through weekly in-service sessions regarding improved communication and team collaboration. These in-service sessions should assist the staff in OR and CSSD to work together and to understand one another's responsibilities in providing complete surgical instrument sets. It however, appears that despite these sessions, communication is not optimal.

"…they (CSSD technicians) fail to inform us (OR nurses) if the instruments tray is incomplete. This lack of communication between the teams in OR and CSSD will never

assist staff to understand the importance of correct or complete instruments." (Participant 9, OR nurse).

4.3.5.1 Miscommunication between OR and CSSD augments the misplacement of instruments

Most participants asserted that miscommunication is one of the biggest problems between OR and CSDD staff at the two public hospitals. To avoid miscommunication, staff should be familiar with the surgical counting practice in the OR and CSSD. OR nurses claimed that CSSD technicians do not have communication skills therefore, miscommunication will remain a problem. Participants stated that CSSD technicians will keep quiet when a surgical instrument is missing. Furthermore, a lack of communication skills can impact negatively on the patient in the OR.

"So this is why we (OR nurses) say it's very important for CSSD to communicate correctly and tell us in time that an essential instrument is missing. But most of the time the CSSD technicians will not communicate such important information to OR staff, and the patient will suffer." (Participant 1, OR nurse).

4.3.5.2 Language barriers contribute to miscommunication

The hospitals recruit staff from around the world. The staff members of OR and CSSD are from different countries, different nationalities and English is not the mother tongue language of each individual staff member. According to CSSD technicians, miscommunication creates confusion among staff and the confusion is aggravated by language barriers.

"The OR nurse will always mix-up the message and creates a confusion when we (CSSD technicians) explain to them (OR nurses) that they have to look for the missing instruments and that the instruments is not in CSSD. The OR nurse will state that we never inform them. I think is most of the time a language barrier and staff do not understand each other". (Participant 7, CSSD technician).

Furthermore, OR nurses' frustrations about the misplacement of the instruments become evident in how they talk/address the CSSD technicians.

"Most OR nurses will scream, they do not talk nicely. '' (Participant 4, CSSD technician).

4.3.5.3 Unilateral meetings of CSSD technicians and OR contribute to miscommunication

Team briefings at the two public hospitals are scheduled separately each morning for half an hour with OR and CSSD staff. OR nurses revealed that team meetings regarding inaccurate surgical trays are done but will exclude CSSD technicians. During the session, staff can raise concerns, e.g. when a surgical instrument tray was incomplete or missing. These sessions are more likely sessions where staff complain about one another and blame one another for missing surgical instruments.

> *"…yeah, the next day during our (OR) morning meetings, we will talk about the missing surgical instruments. Sometime CSSD throw the surgical instruments away and then they (CSSD technicians) do not even know where the instruments is, it is frustrating. Normally during this meeting we do not any solutions for the reason of our missing surgical instruments." (Participant 9, OR nurse).*

Some participants related that due to the separate team meetings, missing surgical instruments and inaccurate surgical trays will never be fully addressed.

> *"So we CSSD are doing our own morning meeting, but if we cannot have one meeting with OR nurses than we will never address the reason for missing surgical instruments. We all have our own opinion; I think the managers have to bring us together so we can speak one language" (Participant 7, CSSD technician).*

4.3.6 Educational support

Staff members are apparently not given opportunities to attend workshops to improve their skills and knowledge; the lack of skills makes staff feel that they are not productive and lack the passion for the task. Thus, counting of surgical instruments will not improve and surgical instruments will continue to come up as missing.

> *"…actually, if we (CSSD technicians) can get a workshop or training on correct counting of surgical instruments. This will help staff to be knowledgeable and vigilant about the complete count. The problems of missing surgical instruments will be solved." (Participant 4, CSSD technician).*

Most participants stated that managers should schedule staff for workshops and staff will be satisfied to attend the session.

> *"Staff satisfaction is very important and it can assist the staff to follow the correct counting procedures to avoid missing instruments. The leadership must recognize that OR staff have to attend these workshops to encourage staff to avoid missing surgical instruments. Education and training is the key to solve the lack of knowledge." (Participant 8, OR nurse).*

Furthermore, several participants raised concerns regarding the lack of knowledge regarding counting surgical instruments.

> *"…they (managers) must really schedule staff for cross training in OR, staff will be happy and content because they will gain knowledge and skills on will know how to count surgical instruments correct and complete and for sure we will have less of missing surgical instruments." (Participant, 7 CSSD technicians).*

4.4 Summary

Through exploring the experiences of OR nurses and CSSD technicians in relation to missing surgical instruments and inaccurate surgical trays, the findings display that participants face multiple challenges that can include the missing surgical instruments, despite the strict implementation of policies and procedures, incorrect counting practice of surgical instruments, non-adherence to quality assurance measurements, miscommunication between OR and CSSD and managerial support.

The incorrect surgical instrument counting practices and non-adherence to quality assurance measures seemed to influence the daily activities in OR and lead to discontent among the OR nurses and CSSD teams. Some participants were of the opinion that the insufficient managerial support can create a stressful environment and the staff is not given the opportunity to raise concerns regarding incorrect counting, that leads to missing instruments and or inaccurate surgical trays.

The next chapter contains recommendations based on the findings of the study, a description of the limitations, and the conclusions.

CHAPTER 5: DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Introduction

The previous chapters provided a description of the rationale for this study, a literature review on the phenomenon under study, a detailed report of the methodology that was applied and the findings of the study. The current chapter provides a discussion of the findings in relation to literature, the conclusion, and recommendations are posed based on the findings and supportive literature.

5.2 Discussion of findings

The experiences of OR nurses and CSSD technicians in relation to missing surgical instruments and inaccurate surgical trays was explored. A discussion is provided on the findings in relation to each objective.

5.2.1 Objective 1: To demonstrate an understanding of the current counting practices of surgical instruments of OR nurses and CSSD technicians.

The findings pertaining to counting practices (Objective1) and quality assurance measure (Objective 2) seem to overlap. Subsequently, the discussion of these 2 objectives, at times, might be repetitive.

OR and CSSD staff are to count instruments according to international counting practices (explained in Chapter 1). However, if the workload in these departments is heavy the staff tend not to adhere to international counting practices. Furthermore, at times, counting is improper and surgical instruments somehow land in the garbage bins. Miscommunication also contributes to incorrect surgical counting due to e.g. language barriers between staff members.

According to Edel (2012:229) OR nurses and CSSD technicians are guided by international policies and procedures to assist with quality improvement measures and to decrease the possibility of missing surgical instruments and inaccurate surgical trays. Shriyan (2015:7-16) found that irrespective of the range of surgical instrument counting policies and procedures accessible to support staff with surgical instrument counting, instruments still go missing. The findings of research completed in Texas, United States of America (Drummond & Skidmore, 2011:937-943) presented that missing surgical instruments must be recorded on a surgical count sheet to track the specific quantity of missing instruments and to stipulate in which

department instruments went missing. Keeping record of missing surgical instruments on the surgical count sheet should promote staff accountability that could reduce the risk of incorrect surgical counts (Drummond & Skidmore, 2011:937-943).

Shriyan (2015:7-16) stated that the inconsistency of surgical instruments counting practices lead to missing surgical instruments and inaccurate surgical trays. Edel (2012:229) conducted a study in the United States of America on staff consistency of adhering to surgical policies and procedures. The author, Edel (2012:229), found that practising the correct surgical counting techniques could avoid surgical instruments from going missing and inaccurate surgical set/trays. Norton, Martin and Micheli (2012:112) however found that CSSD technicians and OR nurses do not follow the international standards and procedures, and most of the staff had excuses to read the policies due to heavy workload that cause tiredness.

5.2.2 Objective 2. Describe the experiences of CSSD technicians and OR nurses in relation to quality assurance measures that serve to prevent the loss of surgical instruments and the presence of inaccurate surgical trays.

In terms of quality assurances measures it emerged that staff are not always aware of updated information about quality assurance measures in their departments. CSSD and OR have separate staff meetings and staff members are not granted sufficient opportunities to voice their opinions on the issues related to the missing surgical instruments and inaccurate surgical trays.

Norton, Martin and Micheli (2012:112) indicated that quality assurance measures are the most important indicators for surgical instrument counting practices to prevent missing surgical instruments and inaccurate surgical trays in OR and CSSD. Phillips (2013:23) indicated that the availability of quality assurance measures in the OR and CSSD should assist OR nurses and CSDD staff to improve surgical instrument counting. Norton ,Martin and Micheli (2012:112) found that the managers in OR and CSDD have to update the quality assurance measures every two years to ensure that staff stay informed regarding developments on counting practices. According to Phillips (2013:2 3) it was evident that a high volume of workload in OR and CSSD had a negative influence on adhering to quality assurance measures.

Participants further restated that the managers should discuss the new information regarding quality assurance measures with them during unit meetings (see Chapter 4, Section, 4.2.2). According to Phillips (2013:23) CSSD and OR staff should be involved with training and regular audits of counting practices. Shriyan (2015:7-16) stated that adherence measures could

promote accountability and reduce the possibility of missing surgical instruments and inaccurate surgical trays.

5.2.3 Objective 3. To explore the experiences of OR nurses and CSSD technicians in relation to inaccurate surgical trays and missing instruments.

The findings revealed that most participants have similar experiences in relation to missing surgical instruments and inaccurate surgical instrument trays. Lack of leadership support was also identified as most of the participants claimed that they are getting the blame if surgical instruments are reported as missing.

According to Shriyan (2015:7-16) OR nurses and CSSD technicians share the experience of missing surgical instruments and inaccurate surgical trays in their departments. Furthermore, staff reported frustrated that they are blamed for a missing instrument and are being treated unfairly by their managers. Goldberg and Feldman (2012: 207) conceded that missing surgical instruments and inaccurate surgical trays have an influence on the standard of patient care and the time spent in the OR. The authors, (Goldberg & Feldman, 2012: 207) identified that miscommunication and poor teamwork are the main reasons that surgical instruments go missing.

The findings of a study completed by Biccard (2018:1589) confirmed that OR and CSSD staff find it difficult to search for a surgical instrument during surgical procedures and not receiving the correct quantities in the surgical tray/set. Furthermore, miscommunication interrupts the workflow, causes confusion, or may create chaos during critical periods of surgical procedures. Goldberg and Feldman (2012: 207) stated that language barriers, experience levels, and incomplete counting practices prevent OR and CSSD staff to reach accurate surgical instrument counts.

5.3 Limitations of the study

The study was conducted in the OR and CSDD of two public hospitals in the eastern region of Saudi Arabia. The research was only conducted in one region, the eastern region and one sector, i.e. the public sector. Furthermore, OR nurses and CSSD technicians working in these departments at private hospitals may have different views. Another limitation is that the interviews were conducted virtually via Microsoft Teams. Interruptions did occur within the network of the internet connection during interviews. Furthermore, one might have missed finer

nuances pertaining to body language that would have been observed during face to face interviews.

5.4 Recommendations

It is essential for OR and CSSD staff to count the surgical instruments accurately to prevent missing surgical instruments and inaccurate surgical trays. The Joint Commission International standards (2017:20) stated that quality assurance is important for organizations to provide safe and high-quality services.

5.4.1 Education and training

An educational programme focusing on prevention of surgical instruments from becoming missing was recommended by the Joint Commission International, by evaluating staff members insight of the correct counting practice of surgical instrument, correct inspection of surgical instruments to prevent inaccurate surgical instruments being used in surgical procedures, and early reporting with no fear of reprisal or punishment (Shriyan, 2015:7-16).

The management of the hospitals under study should ensure that the courses are available for the OR and CSSD staff to keep them knowledgeable and skilled with the current surgical counting practice. Evangelista *et al.* (2020:14-28) recommended that managers should have at least a monthly follow-up session with staff to ensure that staff is familiar with the correct counting practice. Therefore, OR nurses and CSSD technicians should attend the courses to gain the necessary understanding and expertise on how to deal with the occurrences of missing surgical instruments and inaccurate surgical trays. Training could enhance understanding and engagement.

OR and CSSD staff should be taught how to communicate with each other without blame, and report incorrect practices without the fear of being blamed or punishment. Improved communication through managerial commitment and coordinating staff can ensure that hospital environments are free from a culture of blame (Norton, Martin & Micheli2012:112). Training regarding the importance of teamwork and communication will provide staff with the skills to work as a team and be accountable and responsible for missing sets that need to be replaced (Phillips, 2013:23). Education regarding missing surgical instruments and inaccurate surgical trays should include the following: what the proper actions are when in a situation where you have to search for instruments or find there are discrepancies during the accountability process with an inaccurate surgical tray (Zheng*, Hu & Xin,* 2016: 2469–2477).

Furthermore, Norton, Martin and Micheli (2012:112) stated that OR and CSSD managers should ensure that the focus of education and training include/be topics such as: effective communication and problem solving to reduce the miscommunication.

5.4.2 Quality assurance

This is a practice used to measure if the OR and CSSD staff are complying with the organization policies and procedures to avoid missing surgical instruments and inaccurate surgical trays. QA measures also assist with assessing if the services are up to standard in the OR and CSSD. The focus of QA measures is the deliverance of reliable services that is important during surgical procedures (Zheng, Hu & Xin, 2016: 2469–2477). With the OR nurses and CSSD technicians not having to stress on how to deal with an incomplete surgical tray, optimal quality care could be guaranteed by having appropriate standards in place. Management of the hospitals should create a safe culture in the departments by doing the following: encouraging OR nurses and CSSD technicians to report incorrect counting practice among their co-workers, encouraging collaboration by giving OR nurses and CSSD technicians the opportunity to voice their concerns. This will hopefully cultivate a non-blaming environment in the OR and CSSD (Phillips (2013:23).

5.4.3 Supportive work environment

Management of the hospitals should provide a supportive work environment that gives staff(s) the freedom to provide feedback when they have concerns regarding incorrect counting practice. OR nurses and CSSD technicians may need this supportive environment to promote accountability and raise staff morale and awareness to ensure staff follow the correct surgical instruments counting practices. A supportive environment in the hospitals can create a productive situation that could encourage staff members to count surgical instruments (the Joint Commission International standards, 2017:20). Having this supportive environment, staff can feel comfortable going to their managers with all concerns regarding missing surgical instruments, knowing their concerns will get the attention of the manager, that can lead to staff contentment (Goldberg & Feldman, 2012:207).

According to Evangelista *et al.* (2020:14-28) conflict should not be ignored but dealt with immediately. Management of the hospitals should listen to staff concerns and respond accordingly (Phillips, 2013:23). To create a supportive work environment, managers should care for their staff by acknowledging achievements, promoting succession plans, and setting achievable goals (Goldberg & Feldman, 2012:207). The support granted by management can

reduce stressful environments and encourage staff to adhere to the correct surgical instrument management during surgical procedures and the sterilization process (Phillips, 2013:23). Furthermore, the policy and procedure committees of the hospitals should ensure the execution of policies to support staff.

5.5 Recommendations for further research

The following areas for future research are proposed:

- The type of management styles that prevails in OR and CSSD based on the reflection of the OR and CSSD staff.
- The influence of language barriers on counting surgical instruments in OR and CSSD.
- A quantitative research study since it enables research over a large geographical area and the inclusion of more hospitals, ultimately assisting to provide more generalized statements regarding missing surgical instruments and inaccurate surgical trays.

5.6 Dissemination

This thesis will be made available on the website of Stellenbosch University. The findings will be forwarded to the management of the two different hospitals. The study results will also be presented at conferences. Findings will be published in peer-reviewed journals.

5.7 Summary

Study results confirmed that missing surgical instruments and inaccurate surgical instruments in OR and CSSD of the public hospitals within the Eastern Region of Saudi Arabia does occur during surgical procedures and the cleaning and sterilization process. The aim of the study was to explore the experiences of OR nurses and CSSD technicians in relation to missing surgical instruments and inaccurate surgical trays. Moreover, participants expressed their frustrations regarding the missing surgical instruments and inaccurate surgical trays. In addition, the findings to study objectives provided descriptions in terms of the why and how of the occurrence of missing surgical instruments and inaccurate surgical trays.

Therefore, the research question, “What are the experiences of CSSD and OR staff in relation to missing surgical instruments and inaccurate surgical trays?” was answered in the study.

5.8 Conclusions

Both the public hospitals have quality assurance measures, education, and training for staff in place. However, due to heavy workload, staff at times do not adhere to correct counting

practices. The diversity of cultures in the work environment seem to contribute to language barriers and staff not understanding each other leads to incorrect counting of surgical instruments. Separate staff meetings between OR and CSSD could also influence the process on how staff count the surgical instruments. OR and CSSD managers must ensure competency levels are maintained through training, improved communication, and improving methods of accountability and responsibility. These recommendations will hopefully assist to avoid missing surgical instruments and inaccurate surgical trays.

REFERENCES

Armstrong, S., Bhengu, B., Kotze, W., Nkonzo-Mtembu, L., Ricks, E., Stellenberg, E., Van Rooyen, D. & Vasuthevan, S. 2017. A new approach to Professional Practice. Lansdowne: Juta & Co. Ltd.

Banu, A. & Subhas, G.T. 2013. Central sterile supply department–need of the hour, *Journal of Public Health Medical Research,* Vol. 1(2):58-62.

Barimani, B., Ahangarb,P., Nandraa,R. & Porter, K. Perioperative Care and Operating Room Management. The WHO Surgical Safety Checklist: A Review of Outcomes and Implementation Strategies, Vol. 21:7-16

Blackmore, C., Bishop,S., Luker,S. & Williams, B. 2013. Applying Lean Methods to Improve Quality and Safety in Surgical Sterile Instrument Processing. *The Joint Commission Journal on Quality and Patient Safety,* Vol. 39(3): 99-105

Biccard, B.M. 2018. Perioperative patient outcomes in the African Surgical Outcomes Study: a 7-day prospective observational cohort study, Vol. 391(10130):1589-1598

Boeree, C.G. 2006. Personality theories. [Online] Available: http://webspace.ship.edu/cgboer/rogers.html. [2014, January 04]. Condon L. 2012. Safe sterile processing supports safe patient care. Horizons 2012 Spring;(1):20-3

Braun, V. & Clarke, V. 2012. Using thematic analysis in psychology. Qualitative research in psychology 3 (2). Bristol. Available: http://epronts.uwe.ac.uk/11735. [2018. November 28].

Brink, H., Van der Walt, C., Van Rensburg, G. 2015. Fundamentals of Research Methodology for Healthcare Professionals. Third edition. Lansdowne: Juta & Co. Ltd.

Cao, L. 2015. Application of information management system in the management of external surgery instrument. *International Journal of Medical Informatics*, Vol. (39):26 –7.

Chawla,S. Gupta,F. & Onchiri,E. 2016. Water availability at hospitals in low- and middle-income countries: implications for improving access to safe surgical care. *Journal of Surgical Research*, Vol. 205(1): 169-178

Creswell, J., W. 2014. Research Design. Qualitative, Quantitate, mixed Methods Approaches. Fourth Edition. Sage Publications. Washington DC.

Daudt,H., Van Mossel,C., & Scott,S.J. 2013. Enhancing the scoping study methodology: a large, inter-professional team's experience with Arksey and O'Malley's framework. *BMC Medical Research Methodology* Vol.13, (48) 13-48

De Vos, A.S., Strydom, H., Fouche, C.B. & Delport, C.S.L., 2013. Research at grassroots, 4 th edition, Van Schaik Publishers, Pretoria

De Vries, C. & Rosenberg,S. 2016. Global Surgical Ecosystems: A Need for Systems Strengthening. Annals of Global Health, Vol.82(4): 605-613

Drummond, D.C., & Skidmore, A.G. 2011. An evaluation of reusable instruments sterilization and disinfection in the workers, *Canadian Medical Association Journal*, Vol. 15; 145 (8): 937-943.

Edel, S.M. 2012. Surgical count practice variability and the potential for retained surgical items. *Association of PeriOperative Registered Nurses Journal*, Vol. 95(2): 228-238.

Evangelista,M. Guimaraes,M. dos Santos,A. deOliveira, C. 2020. Effectiveness of manual versus automated cleaning on *Staphylococcus epidermidis* biofilm removal from the surface of surgical instruments. *Journal of Surgical Research,* Vol. 48(3): 267-274

Favero, M.S., & Bond, W.W. 2015. Reprocessing medical devices in health care settings, Disinfection, sterilization, and preservation, (Philadelphia, Lippincott Williams & Wilkins, 2015), 5th Edition.

Forrester,J.; Koritsanszky, L. & Parsons,B.2018.Development of a Surgical Infection Surveillance Program at a Tertiary Hospital in Ethiopia: Lessons Learned from Two Surveillance Strategies. *Surgical Infections,* Vol. 19 (1): 25–32

Garbaccio, J.L. & De Oliveira, A.C. 2013. Hidden in the risk segment of decontamination: an assessment of the knowledge of professional and practices in a plastic surgery, *Texto & Contexto Enfermagem, Journal,* Vol. 22(4): 77-83.

Grove, S.K., Burns, N. & Gray, J.R. 2013. The practice of nursing research. seventh edition. St Louis. Elsevier Saunders publishers.

Grove, S.K., Gray, J.K., and Burns, N. 2015. Understanding Nursing Research: Building an evidence-Based Practice. 6th Edition. St. Louis, Missouri Elsevier Saunders.

Goldberg, J.L. & Feldman, D.L. 2012. Implementing AORN Recommended practices for prevention of retained surgical items. Association of Perioperative Registered Nurses Journal; 95(2), 205-219.

Gue´don, C. P., Wauben S. G. L., van der Eijk, C., Vernooij, S. N. , Meeuwsen, C. , Van der Elst, M., Hoeijmans, V., Dankelman, J., & Van den Dobbelsteen, JJ. 2016. Where are my instruments? Hazards in delivery of surgical instruments, *Surgical Endoscopy Journal,* Vol. 30(1): 2728–2735.

Hao H, Xiaoli Z, Hui C. 2012. Value of classified training program in sterile supply center. *Nurses Training*. Vol.27 (15):1361

Huber, L. 2010. Central sterile supply department professionals: a key piece in the OR quality puzzle, *Association of periOperting Registered Nurses Journal*, Vol. 91(3): 319– 320.

Hung, C.Y., & Lin, S.S. 2015. The process improvement of the supplies distribution of the central sterile services department, *Journal of Microbiology, Immunology and Infection*, Vol. 48 (2): 104.

Joint Commission International standards. 2017. Identifies top standards compliance issues for 2017. Available: https://www.jointcommission.org/assets/1/6/13_OBS_Top_Challenging_2017_Stds_.pdf [2018, March 01].

Libguides, 2019. Research Methodology. Research Support. [Online]. Available: https://www.libguides.wits.ac.za/c.php?g=693518&p=4914913 [2019, 30 November].

Merchant,A., Hendel,S.& Shockley,R. 2015. Evaluating Progress in the Global Surgical Crisis: Contrasting Access to Emergency and Essential Surgery and Safe Anesthesia Around the World. *World Journal of Surgery*, Vol. 8 (39):2630–2635

Nicolay CR, Purkayastha S, Greenhalgh A, Benn J, Chaturvedi S, Phillips N.2012. Systematic review of the application of quality improvement methodologies from the manufacturing industry to surgical healthcare. *British Journal of Surgery*, Vol. 99(3):324 –35

Norton E.K., Martin, C., & Micheli, A. J. 2012. Patients count on it: An initiative to reduce incorrect counts and prevent retained surgical items. *Association of Perioperative Registered Nurses Journal*, Vol.95(1): 109-121.

O'Hara,N.; Patel,A. & Caldwell,S. 2015. Sterile reprocessing of surgical instruments in low- and middle-income countries: A multicenter pilot study. *American Journal of Infection Control*, Vol. 43(11): 1197-1200

Phillips, N. 2013. Berry and Kohn's Operating Room Technique. 12th edition. St Louis: Mosby.

Polit, D. & Beck, C. 2018. Essentials of Nursing Research: Appraising Evidence for Nursing Practice. 7th edition. China: Lippincott Williams & Wilkins.

Rowlands, A. & Steeves, R. 2010. Incorrect surgical counts: a qualitative analysis. *Association of Perioperative Registered Nurses Journal, Vol.* 92(4): 410-419.

Saldaña, J. 2015. The Coding Manual for Qualitative Researchers. 3rd edition. California: SAGE

Seavey, RE., 2015. Safe instrument reprocessing, the perioperative role. *Association of periOperative Registered Nurses Journal,* Vol.101 (4): 482–485.

Shriyan, A. 2015. A study on the efficiency of CSSD at a health care center, *Journal of Nursing and Patient Safety & Care* Vol. 1(2): 7-16.

Sukhlecha, A.G., Vaya, S., Parmar, G.G. & Chavda, KD. 2015. Knowledge, attitude, and practice regarding sterilization among health-care staff in a tertiary hospital of western India, *International Journal of Medical Science and Public health*, Vol. 4(10): 1-6.

Weinshel, K., Dramowski,A. & Hajdu.H. 2015. Gap Analysis of Infection Control Practices in Low- and Middle-Income Countries. Available: https://doi.org/10.1017/ice.2015.160 [2019, November 22].

Zheng,W., Hu,Y. & Xin,H., 2016. 'Successful implementation of thirty five major orthopedic procedures under poor conditions after the two thousand and fifteen Nepal earthquake', *International Orthopaedics*, Vol. *40: 2469–2477*

Zhu, X., Yuan, L., Li, T. & Cheng P. 2019. 'Errors in packaging surgical instruments based on a surgical instrument tracking system', Biomed Central Health Services Research, Vol. 19:176.

Appendices

Appendix 1: Ethical approval from Stellenbosch University

UNIVERSITEIT
STELLENBOSCH
UNIVERSITY

Approval Notice

New Application

03/06/2020

Project ID: 11417

HREC Reference No: S20/04/101

Project Title: The experiences of CSSD and OR staff in relation to missing surgical instruments at a public hospital, Eastern Region, Saudi Arabia

Dear Ms Annalene Simmons

The **Response to Modifications** received on 22/05/2020 10:19 was reviewed by members of **Health Research Ethics Committee** via **expedited** review procedures on 03/06/2020.

Thank you for attending to the requested modifications, the research protocol is now finally approved. Please note the following information about your approved research protocol:

Protocol Approval Date: 03 June 2020

Protocol Expiry Date: 02 June 2021

Please remember to use your Project ID 11417 and Ethics Reference Number S20/04/101 on any documents or correspondence with the HREC concerning your research protocol.

Please note that the HREC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

After Ethical Review

Translation of the informed consent document(s) to the language(s) applicable to your study participants should now be submitted to the HREC.

Please note you can submit your progress report through the online ethics application process, available at: Links Application Form Direct Link and the application should be submitted to the HREC before the year has expired. Please see *Forms and Instructions* on our HREC website (www.sun.ac.za/healthresearchethics) for guidance on how to submit a progress report.

The HREC will then consider the continuation of the project for a further year (if necessary). Annually a number of projects may be selected randomly for an external audit.

Provincial and City of Cape Town Approval

Please note that for research at a primary or secondary healthcare facility, permission must still be obtained from the relevant authorities (Western Cape Departement of Health and/or City Health) to conduct the research as stated in the protocol. Please consult the Western Cape Government website for access to the online Health Research Approval Process, see: https://www.westerncape.gov.za/general-publication/health-research-approval-process. Research that will be conducted at any tertiary academic institution requires approval from the relevant hospital manager. Ethics approval is required BEFORE approval can be obtained from these health authorities.

We wish you the best as you conduct your research.

For standard HREC forms and instructions, please visit: Forms and Instructions on our HREC website https://applyethics.sun.ac.za/ProjectView/Index/11417

If you have any questions or need further assistance, please contact the HREC office at 021 938 9677.

Yours sincerely,

Mrs. Brightness Nxumalo
HREC 2 Coordinator

National Health Research Ethics Council (NHREC) Registration Number:

REC-130408-012 (HREC1)•REC-230208-010 (HREC2)

Federal Wide Assurance Number: 00001372
Office of Human Research Protections (OHRP) Institutional Review Board (IRB) Number:

IRB0005240 (HREC1)•IRB0005239 (HREC2)

The Health Research Ethics Committee (HREC) complies with the SA National Health Act No. 61 of 2003 as it pertains to health research. The HREC abides by the ethical norms and principles for research, established by the World Medical Association (2013). Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects; the South African Department of Health (2006). Guidelines for Good Practice in the Conduct of Clinical Trials with Human Participants in South Africa (2nd edition); as well as the Department of Health (2015). Ethics in Health Research: Principles, Processes and Structures (2nd edition).

The Health Research Ethics Committee reviews research involving human subjects conducted or supported by the Department of Health and Human Services, or other federal departments or agencies that apply the Federal Policy for the Protection of Human Subjects to such research (United States Code of Federal Regulations Title 45 Part 46); and/or clinical investigations regulated by the Food and Drug Administration (FDA) of the Department of Health and Human Services.

Appendix 2: Permission obtained from private institution

Kingdom of Saudi Arabia
[redacted]
Al Ahsa

المملكة العربية السعودية
وزارة الحرس الوطني - الشؤون الصحية
مستشفى الملك عبدالعزيز با
الاحساء

NURSING SERVICES DEPARTMENT

[redacted]

MEMORANDUM

Date: **June 8, 2020**

Subject: **Confirmed Study Approval [redacted] or Health Sciences**

To whom it may concern;

Candidate Name	**Annalene Simmons**
Student Number	**18809758**
Proposal Protocol Number	**SP20/020/A**

This is to confirm that the above mentioned Nurse is currently working at [redacted]z [redacted]) – Al Hassa, and that her proposal, "The Experiences of CSSD and OR Staff in Relation to Missing Surgical Instruments" will be conducted at her current working place.

NURSING SERVICES - AL-HASSA

27513

Johanna Greyvenstein
Acting Associate Executive Director – Nursing Services Department
[redacted] – Al Ahsa, Eastern Region
[redacted]
Kingdom of Saudi Arabia
Email: [redacted]
[redacted]

Appendix 3: Permission obtained from research operations

Kingdom of Saudi Arabia
Ministry of National Guard - Health Affairs

المملكة العربية السعودية
وزارة الحرس الوطني - الشؤون الصحية

King Abdullah International Medical Research Center
(KAIMRC)

IRB NCBE Registration No.:
H-01-R-005

(84) 94456 1515 94466 [redacted]

IRB Office

Memo Ref.No. IRBC/0368/20 **E-CTS Ref. No.** **HAS-20-437780-39380**

Study Number: **SP20/020/A**
Study Title: **The experiences of CSSD and OR staff in relation to missing surgical instruments.**
Study Sponsor **Non grant**
IRB Review Type: ■ **Expedited Review** ☐ **Full Board**
[redacted]
Study site(s): **Eastern Region**

Dear **Ms. Annalene Simmons**
Acting Director of Nursing Ambulatory care/ OR/ CSSD NURSE MANAGER
Ministry of National Guard – Health Affairs

[redacted]
After reviewing your submitted research proposal/protocol and related documents, the IRB has APPROVED the submission.
The approval includes the following related documents:

Document/Title	Version	[redacted]
Research Proposal	01	[redacted]
Data Collection	01	[redacted]
Informed Consent Form	01	[redacted]

The approval of the research study is valid for **one year** from the above approval to expiration date.

Terms of Approval:

- **Annual Reports:** An Annual report must be submitted for approval to avoid termination/suspension of your research.
- **Financial report:** If your study is funded project, details financial report should be submitted with the scientific report.
- **Final Report:** After completion of the study, a final report must be forwarded to the IRB.
- **Retention of original data:** The PI is responsible for the storage and retention of original data pertaining to the project for a minimum of five years.
- **Reporting of adverse events or unanticipated problems:** The PI is responsible to report any seriousor unexpected adverse events or unanticipated problems, which could involve any risk to participants or others, or any event on incidents that may have impact on the research or participants.
- **Biological samples:** No biological samples to be shipped out of the Kingdom of Saudi Arabia without prior IRB approval.
- **Participant incentives:** No financial compensation or gifts to be given to participants without prior IRB approval.
- **Storage of biological samples:** All biological samples collected for the purpose of this research must be stored in the KAIMRC related repository.
- You will need to resubmit the proposal to the IRB for review and re-approval before implementing any changes to the approved proposal.
- It is possible that the IRB may decide that the proposed new changes may exclude the proposal from being accepted for exempt review.
- It is your responsibility to safely store the data collected.

[redacted]

Prof. Abdullah Al Sayyari
Chairman, Institutional Review Board (IRB)
Ministry of National Guard - Health Affairs

AA/AB/Areej

P.O. Box 22490, Riyadh 11426
Tel. 8011111
Telex : 403450 NGRMED SJ
(ORACLE 29795)

ص . ب. ٢٢٤٩٠ الرياض ١١٤٢٦
تلفون : ٨٠١١١١١
تلكس ٤٠٣٤٥٠

HA . Printing Press 17 / 137

Appendix 4: Participant information leaflet and declaration of consent by participant and investigator

PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM

Title of Research Project:

The experiences of CSSD and OR staff in relation to missing surgical instruments at a public hospital, Eastern Region, Saudi Arabia

REFERENCE NUMBER:
PRINCIPAL INVESTIGATOR: Annalene Simmons

CONTACT NUMBER: +[redacted]

You are invited to take part in a research project. Please take some time to read the information presented here that will explain the details of this project. Please ask the researcher any questions about any part of this project that you do not fully understand. It is very important that you are fully and clearly understand what this research entails and how you could be involved. Also, your participation is entirely voluntary and you are free to decline to participate. Declining participation will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

The Health Research Ethics Committee at Stellenbosch University has approved this study**.** The study will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, the South African Guidelines for Good Clinical Practice (2006), the Medical Research Council (MRC) Ethical Guidelines for Research (2002), and the Department of Health Ethics in Health Research: Principles, Processes and Studies (2015).

The daily functions of Operating Rooms (OR) are often hampered by missing surgical instruments and inaccurate surgical trays. Accordingly, this study endeavours to explore the experiences of OR staff and the technicians working at the Central Sterilize Supply Department (CSSD) in relation to missing surgical instruments and inaccurate surgical trays. The study will be conducted at two public hospitals in the Eastern Region of Saudi Arabia. Someone not affiliated to the OR and CSSD departments of the 2 participating institutions will interview OR nurses and CSSD technicians on their experiences about the topic at hand. Thereafter the interviews will be transcribed by an independent transcriber and the principal investigator will analysis the transcriptions.

The specific objectives are:

- To understand the current counting practices of surgical instruments of OR nurses and CSSD technicians.
- Describe the experiences of CSSD technicians and OR nurses in relation to quality assurance measures that serve to prevent the loss of surgical instruments and the presence of inaccurate surgical trays.

- To explore the experiences of OR nurses and CSSD technicians in relation to inaccurate surgical trays and missing instruments.

You have been invited to participate in the study because you have worked for more than one year in the OR and CSSD and can share your experiences related to missing surgical instruments and inaccurate trays.

The only responsibility that you have is to relate your experiences about the topic at hand during the interview.

There is no financial benefit to participants. Participants will be compensated for their time and effort. Each participant will receive a gift voucher to the value R100. The findings however, are aimed to improve the management of surgical instruments and trays in the OR and CSSD.

There are no possible risks involved in the study. No risks have been identified.

Participation is voluntary and we will respect your decision should you decline to participate.

Privacy, confidentiality and anonymity of all participants will be ensured at all times. Confidentiality will be ensured by protecting all data gathered from being made available to any other unauthorized person. Information obtained will not identify the participant personally. Therefore participants will be addressed by aliases during the interviews. In addition, for labelling of the audio recordings, pseudo names will be used. All written notes and transcripts of the interviews will be kept in a locked safe for five years where after it will be destroyed. Only the researcher and the supervisor involved in the study will have access to the information. The information will be used in a publication or thesis where participants' identity will remain protected.

Is there anything else that you should know or do?

- You can contact Annalene Simmons at [redacted] if you have any further queries or encounter any problems.
- You can contact the **Health Research Ethics Committee** at 021-938 9207 if you have any concerns or complaints that have not been adequately addressed by your study doctor.
- You will receive a copy of this information and consent form for your own records.

Declaration by participant

By signing below, I ……..……. agree to take part in a research study entitled *The experiences of CSSD and OR staff in relation to missing surgical instruments***.**

I declare that:

- I consented to participate in the study via an interview
- I consented that the interview be recorded
- I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable.

- I have had a chance to ask questions and all my questions have been adequately answered.
- I understand that taking part in this study is **voluntary** and I have not been pressurised to take part.
- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.
- I may be asked to leave the study before it has finished, if the study doctor or researcher feels it is in my best interests, or if I do not follow the study plan, as agreed to.

Signed at (place) .....…..…… on (date) ……...…….. 2020.

....

Signature of participant **Signature of witness**

Declaration by investigator

I (name) ……..…… declare that:

- I explained the information in this document to ……..
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I did/did not use an interpreter. (If an interpreter is used then the interpreter must sign the declaration below.

Signed at (place) .....…..… on (date) ……...…….. 2020.

....

Signature of participant **Signature of witness**

Appendix 5: Interview guide

22.1 Interview guide

1. Tell me your experiences about current counting practices of surgical instruments?.

2. Tell me your experiences about adhering to quality assurance measures?

3. Could you talk about the actual inaccurate instruments?

Probes: when the inaccuracy is actually noticed, what is done immediately once an inaccurate instrument is noticed, culture of guilt, actual statistics of losses – how that is communicated, the management of inaccurate instruments

Appendix 6: Confidentiality agreement with data transcriber

Lona's Language Services

English/Afrikaans
Afrikaans/English

3 Beroma Crescent Beroma Bellville

Cell 0782648484
Email illona@toptutoring.co.za

* Translations * Editing * Proofreading
* Transcription of Historical Docs
* Transcription of Qualitative Research
* Preparation of Website Articles

TO WHOM IT MAY CONCERN

This letter serves to confirm that the undersigned

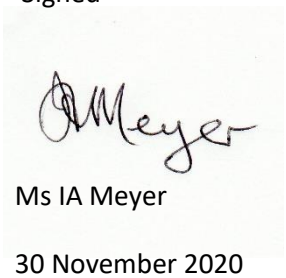
ILLONA ALTHAEA MEYER

has done the transcriptions for the **Pilot Study** of the **thesis of Annalene Vries**

and agreed to respect the confidentiality of the data provided.

TITLE: The experiences of CSSD and OR staff in relation to missing surgical instruments at a Public hospital, Eastern Region, Saudi Arabia.

Signed



Ms IA Meyer

30 November 2020

Appendix 7: Extract of transcribed interview

Transcription Institution A (PILOT STUDY)
Interviewer: Good afternoon. Participant 1: Good afternoon. Interviewer: Thank you for joining this research programme. We are just collecting data for one of the staff that is collecting for her studies. So, I will be just asking you a few questions with regard to your experience with the CSSD or OR staff relations with the missing surgical instrument. Participant 1: Ok. Interviewer: Yeah, as I have explained in the consent that you've signed that this study is strictly confidential no names will be used, so we'll use you as a participant one and for, if you feel uncomfortable at any time, please let me know, we can stop and at the long run if we want, the study owner needs extra information maybe I might come back to you. Participant 1: Ok no problem. Interviewer: For this sake we are recording this for just technology as a backup we'll be recording it's on the recorder and as you know my name is Prisca so I'm just a data collector. Participant 1: Ok. Interviewer: And then for the sake of this recording today the date is July 6, 2020 and it's an afternoon time in Saudi Arabia. If I may ask you if you can tell me a little bit about yourself. Participant 1: So, my name as you can see on the consent form is …managing the operators' room right now. I have been working in Saudi Arabia for the past five years and prior to that I've been working back in South Africa for plus minus 20 years in the operating room. So yes, I feel that it is my forte and as we all know now with the current Covid crisis everybody is not at ease so lot of stress, lot of tension around but I mean other than that you know I enjoy my job. I am very passionate about my job yes, it can be challenging every now and then, especially in the office trying to be the social worker, trying to be the psychologist, so a day in the life of you know managing OR can be quite stressful, but by the grace of God we can make it through each day and say yeah we did this and we are ready to go yep! Interviewer: OK, from what I can gather, is that you're passionate about your work, looking at the experience, the number of years you've worked it is almost 25 years, 20 years in South Africa and five years in Saudi. And your work can be challenging at times that's what I can gather, you end up working as a social worker and you become as a manager, you become, you have a lot of rules to cover and you talk about stress in OR. Can you expand a bit about that?

Appendix 8: Investigator declaration

UNIVERSITEIT·STELLENBOSCH·UNIVERSITY
jou kennisvennoot • your knowledge partner

HEALTH RESEARCH ETHICS COMMITTEE 1 AND 2

INVESTIGATOR'S DECLARATION

(INFORMATION SHOULD BE TYPED)

The principal investigator, supervisor, as well as all sub- & co-investigators must each sign a separate declaration.

SECTION 1: INVESTIGATOR DETAILS and ROLE IN THIS RESEARCH							
Title, First name, Surname: Annalene Simmons		**SU number:** 18809785				***PROJECT ID NUMBER*** *(HREC office use only)*	
Professional Status: Nurse manager Operating Room / Acting Director of Clinical Nursing							
University DIVISION and DEPARTMENT: Nursing							
Telephone No:			**E-mail address:**				
Role *(mark with x)*	**Principal investigator**	☒	**Co-investigator**	☐	**Sub-investigator**	☐	**Supervisor** ☐

SECTION 2: PROJECT TITLE *(maximum 250 characters for database purposes)*

The experiences of CSSD and OR staff in relation to missing surgical instruments at a public hospital, Eastern Region, Saudi Arabia

SECTION 3: CONFLICT OF INTEREST DECLARATION (OBLIGATORY)

I, *(Title, Full name)* Annalene Simmons declare that:

☒ I have **no financial or non-financial interests**, which may inappropriately influence me in the conduct of this research study; **OR**

☐ I **do have the following financial or other competing interests** with respect to this project, which may present a potential conflict of interest: (Please attach a separate detailed statement)

Signature: Annalene Simmons **Date:** 31/3/2020

SECTION 4: DECLARATION (OBLIGATORY)

I, *(Title, Full name)* Annalene Simmons declare that:

- **I have read through the submitted version of the research protocol and all supporting documents and am satisfied with their contents**
- I am **suitably qualified and experienced** to perform and/or supervise the above research study.
- I agree to conduct or supervise the described study **personally** in accordance with the relevant, current protocol and will only change the protocol after approval by the **HREC**, except when urgently necessary to protect the safety, rights, or welfare of subjects. In such a case, I am aware that I should notify the HREC without delay.
- I agree to timeously report to the HREC **serious adverse events** that may occur in the course of the investigation.
- I agree to maintain **adequate and accurate records** and to make those records available for inspection by the appropriate authorised agents when and if necessary.
- I agree to comply with all other requirements regarding the obligations of clinical investigators and all other pertinent requirements in the Declaration of Helsinki (2013), as well as South African and ICH GCP Guidelines and the Ethical Guidelines of the Department of Health as well as applicable regulations pertaining to health research.
- I agree to comply with all regulatory and monitoring requirements of the HREC.
- I agree that I am conversant with the above **guidelines**.
- I will ensure that every patient (or other involved persons, such as relatives), shall at all times be **treated in a dignified manner and with respect**.
- I will submit all required reports within the stipulated **time frames**.

Signature: Annalene Simmons **Date:** 31/3/2020

HREC Declaration Form V4.2 February 2015
Stellenbosch University, Faculty of Medicine and Health Sciences

Appendix 9: Turnitin report

My Submissions

Thesis

Title	Start Date	Due Date	Post Date	Marks Available
Thesis submission - Thesis	23 Nov 2020 - 12:11	8 Dec 2020 - 12:11	8 Dec 2020 - 12:11	100

Summary:

Use this link to check for plagiarism and obtain a report before submitting your thesis.

Refresh Submissions

	Submission Title	Turnitin Paper ID	Submitted	Similarity
View Digital Receipt	A.Simmons Thesis	1460475114	5/12/20, 11:40	13%

turnitin

Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

Submission Author	ANNALENE Simmons
Turnitin Paper ID (Ref. ID)	1460475114
Submission Title	A.Simmons Thesis
Assignment Title	Thesis submission
Submission Date	05/12/20, 11:40

Appendix 10: Declaration by language editor

Lona's Language Services

English/Afrikaans
Afrikaans/English

3 Beroma Crescent Beroma Bellville

Cell 0782648484
Email illona@toptutoring.co.za

* Translations * Editing * Proofreading
* Transcription of Historical Docs
* Transcription of Qualitative Research
* Preparation of Website Articles

TO WHOM IT MAY CONCERN

This letter serves to confirm that the undersigned

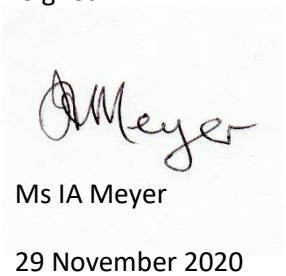
ILLONA ALTHAEA MEYER

has edited and proofread the **thesis of Annalene Simmons**

for language correctness and translated the Abstract.

TITLE: The experiences of CSSD and OR staff in relation to missing surgical instruments at a Public hospital, Eastern Region, Saudi Arabia.

Signed



Ms IA Meyer

29 November 2020

Appendix 11: Declaration by technical editor

Lize.net
COMMUNICATION (Pty) Ltd
Company registration: 2019/050723/07

To whom it may concern

This letter serves as confirmation that I, Lize Vorster, performed the technical formatting of Annaline Simmons' thesis.

Technical formatting entails complying with the Stellenbosch University's technical requirements for theses and dissertations, as presented in the Calendar Part 1 – General or where relevant, the requirements of the department.

Yours sincerely

Lize Vorster
Language Practitioner

Vygie street 9, Welgevonden Estate, Stellenbosch, 7600 * e-mail: lizevorster@gmail.com * cell: 082 856 8221